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## OBSERVATIONS ON TWO CASES OF TUBERCULOUS PERICARDITIS WITH EFFUSION.


BY WILLIAM SYDNEY THAYER, M. D.

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CASE I.—*Tuberculous pericarditis. Large effusion. Paracentesis of the pericardium in the 5th space about ¼ cm. within the mamillary line.*

W. E. H., aged 26. Family history, in no way remarkable. Father, living and well. Six brothers and sisters, in good health. One sister died in infancy.

The patient is a curtain hanger by occupation, of regular habits and good previous history. He has had none of the serious illnesses of childhood and considered himself perfectly well until the spring of 1898, when he had a left-sided pleurisy with effusion, which kept him in bed for a month. In the spring of 1901, he had a similar attack again of a month's duration.

Three or four weeks ago while dressing, he leaned over to pick up one of his shoes and fell to the ground in a faint. He soon recovered consciousness but felt weak and "giddy" and sent for a doctor who advised him to stay at home. About a week later he began to suffer from shortness of breath, and gradually with increasing dyspnœa, there developed a fulness in the præcordial region. The patient was under the charge of Dr. Fenby, who recognized the presence of a pericardial effusion and advised aspiration.

On the 31st of October, I saw the patient in consultation with Dr. Fenby. He was in bed lying on the left side. There was marked dyspnœa. The expression was anxious, the lips, somewhat cyanotic. The pulse was of small size and low tension, irregular and intermittent, uncountable at the wrist. By stethoscope, about 150 beats could be made out to the minute. The respirations were shallow, 50 to the minute.

There was a marked bulging of the whole præcordial region. The movements of the chest were rather more extensive on the

right than on the left. The cardiac impulse was inappreciable on inspection or palpation.

On *percussion* the cardiac dulness was enormously increased, beginning above in the first space, extending outward to the nipple line on the right, and to the left away beyond the nipple into the posterior axilla. The cardiac flatness was also greatly increased, reaching the hepatic flatness at about the mamillary line on the right and on the left far out in the mid-axilla. On the left it began above at the second place.

At the left apex the resonance was somewhat dull and tympanitic. On the right there was also a distinct tympanitic quality, though the sound was clearer. In the back there was slight dulness at the left apex, while elsewhere the note was more tympanitic than on the right side.

On *auscultation* a few fine râles were heard at both bases, while at the left apex the respiration was enfeebled, the breezy quality of the inspiration was lost, and medium and fine, rather sticky râles were heard on inspiration.

In the whole præcordial region the heart sounds were almost absent; entirely so below the fifth rib. Above, they were so extremely feeble and distant that nothing definite could be determined as to their character.

It was decided to aspirate immediately. The patient was placed in a chair in a semi-recumbent posture, and a point for aspiration was selected in the fifth space about two fingers' breadth inside the mamillary line. It seemed wise to aspirate at this point in order to establish better drainage than could be obtained by seeking a point nearer the sternum. The danger of striking the heart was deemed to be slight on account of the fact that careful auscultation seemed to definitely indicate that the apex was at a higher point. The history and character of the case were such as to leave little doubt that the effusion was serous, and the danger of infecting the pleura seemed relatively slight. The trocar was introduced at this point and slowly advanced obliquely backwards and toward the median line. Immediately on its introduction, the fluid spurted out with a force indicating that it was contained under considerable pressure. 1250 cc. of almost clear, yellowish, straw-colored fluid were withdrawn. At the end of this time the rate of the pulse had materially diminished although there were frequent intermissions. By moving the trocar upwards the heart could at times be felt and the rubbing of the end of the trocar against the visceral pericardium resulted in the withdrawal of a few drops of blood. During the aspiration the respirations gradually became quieter, the dyspnœa diminished and finally almost disappeared. At the end of aspiration the respirations were 28 to the minute, as compared with a rate of 50 at the beginning.

On *percussion* of the heart after the withdrawal of the trocar, the flatness to the right of the sternum was found to have completely disappeared, the lung having come back into place. The relative dulness, however, still preserved a somewhat triangular shape, the angle between the cardiac dulness and hepatic flatness on the right side remaining obtuse. On the left, the flatness ended at a point inside the nipple line and the cardiac impulse was well felt in the 4th space or about under the fifth rib, just inside the nipple. There was also visible pulsation in the third space. On *auscultation*, the heart sounds at the apex were loud and accompanied by a very slight to-and-fro pericardial friction which was well heard over the right ventricle, along the sternal border and at the base. The second pulmonic sound was somewhat accentuated. The pulse remained rapid, between 130 and 140, but was regular and of much better size and tension.

About a month later, on the 21st of November, the patient who had steadily improved, called at my office with Dr. Fenby. At that time he looked rather pale though the mucous membranes were of fairly good color. The pulse was rapid, about 130 at the beginning of examination, in great part, probably, the result of excitement.

On physical examination the left upper chest was found to be distinctly flattened, while the motion on respiration was also slightly deficient.

*Heart.*—There was marked pulsation in the second, third and fourth left interspaces and over the whole præcordial area. The apex impulse was in the fourth space, 10 cm. from the median line, just inside the nipple. Dulness began at about the second space and extended 5 cm. to the right of the median line. *The angle between cardiac dulness on the right and the hepatic flatness was acute, the dulness showing the normal curved outline.* There was no flatness to the right of the sternum and no dulness outside of the point of maximum impulse. At the apex the impulse was of moderate intensity, while over the base there was a well marked diastolic shock. The first sound was clear at the apex, the second, reduplicated during inspiration. In the pulmonic area the second sound was reduplicated during the latter part of inspiration. Otherwise the sounds were clear. There was no friction murmur.

*Lungs.*—At the apex of the lung on the left side, the note was duller than on the right; the vocal fremitus was of about equal intensity on the two sides. The respiratory murmur on the left was rather enfeebled; expiration prolonged. Numerous fine and medium moist râles were audible after cough; these were heard throughout the front. The right side was absolutely clear.

In the back, the right side was clear throughout on percussion and auscultation. On the left, there was slight dulness with enfeebled respiration in the supra-spinous fossa where fine râles were heard on cough; elsewhere, clear. There was no Broadbent's sign.

8-vii-1900. In response to a letter the patient called to-day. He says that he has felt rather weak but has been at work off and on since the fall, working steadily through January, February, May and June. In December his voice became so hoarse, that he could barely talk aloud, and his inability to work steadily has depended entirely upon this trouble, as he has been unable to make himself properly heard. He consulted Dr. Warfield, who discovered that there was paralysis of the left vocal cord. Later, another laryngologist told him that he had an ulcer upon one of his vocal cords.

His appetite is good and he weighs as much as usual, 125-128 pounds.

The patient looks better than when last seen, though his voice is very hoarse. The color is good; tongue, clean. Pulse, at beginning of examination, 25 to the quarter.

*Lungs.*—Thorax, somewhat flattened in the whole upper left front above the nipple; perhaps a little so in the axilla. Expansion somewhat deficient on that side. Percussion note, somewhat deficient above the fourth rib on the left; clear on the right. Vocal fremitus, more marked on the right. On quiet breathing the respiration is a little puerile in the right front with slightly interrupted inspiration above the clavicle. On the left there is a tubular modification of the respiration; the inspiration is softened and less breezy than usual; expiration, prolonged. Below the fourth rib the respiration is normal. Occasional fine râles above the right clavicle, after cough. Numerous fine and medium moist râles above the fourth rib in the left front, exploding after cough. Vocal resonance, increased. Slight dulness over the upper lobe in the left back with the same rather enfeebled and slightly modified respiration and fine râles. Otherwise the breathing is clear throughout.

*Heart.*—There is well marked visible pulsation in the second, third and fourth left spaces, extending outwards nearly to the mamillary line. There is no retraction at the apex. On palpation the shock of the second sound in the pulmonic area is well felt. The point of outermost impulse is clearly localized, visible and

palpable in the fourth space 8½ cm. from the median line. The relative dulness begins in the second space and extends obliquely outward to this point. On the right it has a distinctly round outline extending at its farthest point, at about the lower border of the fourth cartilage, 4 cm. from the median line. The cardiac flatness begins at the fourth rib, extending obliquely outward to the point of maximum impulse. On deep inspiration the lung comes down so as to almost cover the cardiac flatness. There is no flatness beyond the left sternal border. The cervical veins are scarcely visible; no diastolic collapse.

At the apex the heart sounds are perfectly clear beyond a slight reduplication of the second sound which is heard during inspiration. In the tricuspid area the sounds are clear excepting for this reduplication for several beats with inspiration; the second part of the reduplication is accentuated. In the pulmonic area the sounds are clear. In the second left space the second sound is sharply accentuated. On inspiration this sound is reduplicated during several beats, the second part of the reduplication being accentuated. In the second right interspace the second sound is sharp but not nearly as much so as in the pulmonic area. The same reduplication is heard during inspiration, but the first part of the split sound is accentuated, clearly showing that the reduplication is due to pulmonic delay. There is no indication of Broadbent's sign. When the patient lies on the right side, the apex impulse remains practically *in situ;* the limits of dulness on the right side do not move. When the patient lies on the left side, the position of the apex impulse changes but little. The actual difference in the position of the point of maximum impulse with change of position, is only about 1 cm., measuring about 8 cm. when the patient lies on his right and 9 when he lies on his left side. Blood pressure (Riva Rocci) 125 mm.; temperature 98.7°.

9-vii-'03. The patient called to-day on Dr. Warfield who sent me the following note. "Mr. H. called this morning and I find that his larynx has changed since I first saw him. Then the left cord was paralyzed, but now in addition, both cords are thickened and covered with fine superficial ulcers which are clearly tuberculous. The ulcers are very superficial and there is very little infiltration outside of the cord. * * * * *"

27-xi-'03. The patient called to-day in answer to a letter. He has been feeling quite well and working steadily since the last note. He has but little cough; does not know his weight.

He looks like a different man. The color of the face, lips and mucous membranes is good. Tongue, clean. Pulse, regular, of good quality, 94. The size and pressure are fair; the vessel wall is not palpable.

*Lungs.*—The thorax on inspection shows a well marked flattening of the left front and also a slight retraction of the whole side, with diminished expansion, particularly in the upper part of the front. The vocal fremitus is more marked in the upper left front and there is slight dulness in the first three spaces; little or no dulness below the third rib. On quiet respiration the inspiratory murmur, on the right side, is rather harsh and slightly wavy. On the left side there is a slight tubular modification of the respiration which is enfeebled, occasional medium moist râles being heard during inspiration. Occasional fine and medium râles are also heard throughout the front. On deep respiration and cough there are fine moist râles just above and below the right clavicle and throughout the left upper lobe, more marked at the apex. Throughout the rest of the right front and the lower lobes on both sides, the respiratory murmur is clear.

*Heart.*—There is a wide area of cardiac impulse seen in the second, third, fourth and fifth spaces and over the fifth rib. The whole chest in the præcordial region moves. The point of maximum impulse in the apex region is to be felt, 8.7 cm. from the median line in the fourth space, dulness extending 4.7 cm. to the right. On standing, the impulse becomes distinctly more marked and clearly defined. This point is relatively fixed, being 8 cm. from the median line when the patient lies on the right, 10 when he lies on the left side. On inspiration the lung descends a little in the præcordial region, but scarcely more than a finger's breadth, flatness beginning at the fourth rib on expiration, in the fourth space on inspiration. When the hand is placed over the præcordium or the apex, two impulses are felt. At the apex the stronger, more deliberate impulse, that resembling the shock associated with the ventricular contraction, is synchronous with the protrusion at the point of outermost impulse. On auscultation, however, it becomes evident that *this impulse is diastolic and not systolic; that the whole præcordium is retracted with systole, rebounding with diastole in such a manner as to simulate an ordinary cardiac impulse.*

The first sound at the apex is of moderate intensity; the second, associated with the impulse, is slightly reduplicated. This reduplication is heard all over the cardiac area, most markedly in the pulmonic region. The separation between the two parts of the sound is increased on inspiration—clearly a reduplication due to pulmonic delay. In the tricuspid, pulmonic and aortic areas, the first sound is of moderate intensity but clear. The second pulmonic is louder than the second aortic sound. There is no trace of Broadbent's sign.

The more interesting features of the case are:

(1) The large amount of fluid obtained on aspiration.

(2) The subsequent development of paralysis of the left vocal cord, due undoubtedly to sclerotic changes in the mediastinum following involvement of lymphatic glands or extension of the tuberculous process from the pericardium or lung.

(3) The gradual development of the signs of adherent pericardium.

(4) The completeness of the recovery after so extensive an effusion.

CASE II.—*Tuberculous pericarditis. Large effusion. Aspiration in the 6th left space at the sternal border and in the left costo-xyphoid angle, unsuccessful, the needle coming immediately into contact with the dilated heart. Death. On autopsy the enlarged and dilated heart was not adherent to, but contiguous with the anterior wall of the pericardial sac, the fluid, over 1200 cc., lying posteriorly and at the lateral angles.*

R. C. W., aged 59, a German saloon keeper, was admitted to the hospital at half past twelve o'clock on the first of September, 1903. The patient's complaint was of weakness and shortness of breath which had been coming on gradually for several years. The respiratory distress had greatly increased during the preceding few days. No previous history could be obtained.

The following note was made by Dr. Cole. "Moderately well nourished, muscles flabby. At the time of examination the patient is lying flat with the head slightly propped up; looks very ill; considerable cyanosis of the lips, ears and finger tips. Respirations, 10 to the quarter. The patient is coughing occasionally; frequent expiratory grunts. The pupils are small; react well to light. Tongue dry, slightly coated. * * * Veins of the neck are very full. No marked pulsation of deeper vessels. No general glandular enlargement. Chest; expansion fairly good, equal. Considerable respiratory distress. Resonance, clear throughout right front and axilla and left upper front, but note is markedly impaired in the lower left axilla and in the lower left back up to the angle of the scapula. On auscultation, on the left, the breath sounds are clear throughout the upper front and upper back except for a few râles in the interscapular space. Below,

they are very distant, practically absent at the extreme base excepting just at the angle of the scapula, where they are a little harsher and the suggestion of a pleural friction is occasionally heard. On the right side the breath sounds are quite clear throughout, except in the lower back where there are mucous râles and the breath sounds are distant.

*Heart.*—Point of maximum impulse is neither visible nor palpable. Over the entire præcordium no impulse can be felt. There is a very wide area of absolute dulness. The relative cardiac dulness begins at the middle of the third rib, extending to a point 16.5 cm. to the left in the 5th interspace, when the patient lies on the right side. When on his back, however, the limits of dulness are difficult to make out as they extend well out into the axilla. On the right side the dulness extends apparently 7 cm. outward in the fourth interspace, the angle between the upper limit of liver dulness and the cardiac dulness being very obtuse. There is definite præcordial bulging, though the intercostal spaces seem no fuller than on the right. At the apex and over the entire præcordium no impulse can be felt. At the apex and over the entire præcordium the heart sounds are barely audible until one reaches almost the costal margin in the fourth and fifth interspaces where the sounds are faintly heard. A to-and-fro friction murmur is also audible over the sternum from the third to the fifth rib. The murmur sounds superficial, louder during expiration than inspiration; not apparently increased by pressure of the stethoscope; it sounds suspiciously pericardial in character but not definitely so. The heart's action is of almost fœtal rhythm. The sounds are heard more loudly in the second interspace, neither aortic nor pulmonic being especially accentuated. The pulse is very small; it can hardly be counted. The abdomen is full; no movable dulness in the flanks; feet and legs markedly œdematous."

At 5.45 P. M. I saw the patient with Dr. Cole. He was at that time prepared for paracentesis of the pericardium. At my suggestion Dr. Cole adopted the method advised by Delorme and Mignon.[1] The patient was placed in a semi-recumbent position, and an incision about 2 cm. long was made at the left sternal margin at the level of the sixth interspace, ethel chloride having been used previously to deaden sensation. A small trocar was then inserted in the angle between the ribs as close to the sternal margin as possible. This was introduced vertically to about the depth of the sternum, then tilted so as to pass under the sternum and finally inserted carefully into the pericardium, the needle pointing downward, inward and to the right. After withdrawing the rod a small amount of bloody fluid escaped. On inserting the trocar further the rubbing of the heart against the end could be distinctly felt. On withdrawing slightly a few cc. of clear fluid escaped and then the flow stopped. This procedure was repeated several times, each time with a similar result. A Potain aspirator was then attached to the trocar but only a few cc. of fluid were obtained, the tube soon becoming stopped. This was repeated several times, the trocar being moved in different directions but without result. The rubbing of the heart against it was often felt. An aspirating needle was then inserted upward and backward through the left costo-xyphoid angle, but again only a few cc. of fluid were obtained; not more than 40-50 cc. in all were removed. Owing to the patient's moribund condition it was thought best that no further efforts be made.

I was unfortunately obliged to leave before the end of this procedure and witnessed only the first attempt at aspiration.

At *autopsy* the pericardium was found to be markedly distended. The distension, however, extended more to the left than to the right; a large sac-like projection almost filling the left axilla. There was also considerable distension to the right. The heart lay almost directly against the anterior wall at the point where the needles had been inserted. On inserting the needle of a large syringe in various directions above and to the right and left of the heart, about 800 cc. of fluid were removed, and after opening the parietal pericardium about 400 cc. more escaped.

From the position of the heart at autopsy it could be seen that the aspiration had been attempted at almost the worst possible place. Dr. Cole observes in a note made after the autopsy: "The fact that the heart sounds were heard loudest over the sternum and along the left sternal margin together with the fact that the friction rub was audible here, should have led me to insert the needle either to the right of the sternum or far to the left outside of the mamillary line."

The pericardium contained about 125 cc. of slightly turbid dark, thick, firm, yellow fibrinous exudate. This was rough and shaggy and in many places rounded in the form of ridges. The outer surface of the pericardium on the left, showed many small yellow tubercles, averaging about 2 mm. in diameter.

The heart was greatly enlarged and rather soft, the surface, covered with a mass of fibrinous exudate similar to that seen on the parietal surface of the pericardium. The right ventricle was considerably dilated. The aortic valves were thickened and sclerotic. At their base, on the superior and inferior surfaces were numerous small tuberculated calcareous masses. The superior edges of the valve were connected with the aortic ring by many firm fibrous bands. The valve must have offered obstruction to the blood stream. Nothing remarkable in the other valves. The heart muscle was of a dark reddish color and very soft. The papillary muscles showed numerous fibroid patches. The coronary arteries were rather tortuous and showed many small, raised yellow plaques.

The left pleura contained about 700 cc. of slightly turbid, straw yellow fluid. Both lungs contained numerous small areas of tuberculous broncho-pneumonia. The bronchial and tracheal glands were enlarged and caseous.

These cases have seemed to me worth reporting for various reasons. The former chiefly on account of the amount of fluid obtained by aspiration, the latter because of its bearing upon the question as to the position of the point of greatest advantage for aspiration in pericardial effusions.

### The Size of Pericardial Effusions.

The amount of fluid which the pericardium may contain is enormous. Verney[2] extracted 900 cc. of fluid from the pericardium of a young man of 23, on two occasions separated by an interval of three days. At autopsy, twenty-three days after the first puncture, the pericardial sac contained over 4000 cc. of yellowish fluid. It is not rare to find from 800 to 1000 cc. of fluid in the pericardium. The largest effusions are, however, usually purulent, and records of the evacuation of from 1- to 2000 cc. of pus are not extremely rare. The largest amounts of which I have found record are in several Russian cases mentioned in West's interesting article.[3] In three of these cases four and a half, five and five and a half pounds of blood, respectively, were removed from the pericardium. These were all cases of scorbutus which ended in recovery. In but few instances, however, has the removal *intra vitam* of a greater quantity of serous fluid been reported than in our first case.

[1] Rev. de chir., 1895, xv, 797; 987; 1896, xvi, 56.

[2] Gaz. hebd. de méd., Paris, 1856, iii, 793.

[3] Med. Chir. Tr., Lond., 1883, lxvi, 235.

### INDICATIONS FOR PARACENTESIS OF THE PERICARDIUM.

Although aspiration of the pericardium is a relatively simple procedure, it is not one which is frequently demanded even in large effusions.

Delorme and Mignon[4] observe wisely that "The opening of the pericardium should be reserved for those cases only where the *limits of the tolerance of the heart are passed or the phenomena of cardiac adynamia begin to appear.* . . . Great dyspnœa, irregular and rapid pulse, extensive præcordial dulness, difficulty in appreciating the heart sounds demand intervention, whatever may be the duration of the symptoms and acuteness or chronicity of the affection."

### DIAGNOSIS OF PERICARDIAL EFFUSION.

There can rarely be serious doubt as to the existence of a pericardial effusion in instances where it is large enough to produce symptoms calling for interference, and yet mistakes have been made even in such cases. Rotch[5] some years ago, demonstrated clinically and by injections of cocoa butter into the pericardium, that the presence of fluid in the pericardial sac results early in the appearance of flatness in the fifth right intercostal space, contrary to what is usually the case in dilatation or hypertrophy of the heart. But flatness in the fifth right space *may* be present under these latter circumstances.

The essential point in distinguishing extensive cardiac hypertrophy with or without pericardial adhesions, from fluid in the pericardial sac was pointed out in 1896 by Ewart,[6] who called attention to the fact that it is not the extent or shape of the area of cardiac *flatness* (absolute dulness) which is important. This, of course, represents the amount of pericardium uncovered by air-containing lung, and may naturally depend upon a variety of circumstances. The important point is the shape of the area of *dulness* (relative dulness). The pericardial sac full of fluid always has a more or less triangular shape, and the area of pericardial dulness extends obliquely outward on the one hand to the splenic flatness or the lower limit of pulmonary resonance, and on the other to the hepatic flatness. The right side of the heart, however hypertrophied it may be, always has a curved outline corresponding to the shape of the right auricle, and this curved outline it is possible to make out in most instances by careful percussion. The angle between the relative dulness of the heart and the line of flatness of the liver is thus an acute angle corresponding to the shape of the right side of the heart. If, however, there be fluid in the pericardium the shape of the non-resonant body—the pericardium filled with fluid—which lies in part beneath the lung, is triangular, and the angle between the dulness over the pericardium and the flatness of the liver will be an obtuse angle. Careful attention to this point serves to distinguish good-sized effusions from cardiac hypertrophy where the anterior border of the right lung may be so far removed from the sternum as to cause flatness in the fifth right space. It is, moreover, especially valuable in the recognition of very early and slight collections of fluid in the pericardium.

A large proportion of errors in diagnosis in thoracic affections depends upon the lack of attention to the tedious minutiæ of careful percussion of the chest. Those who, in obscure cases of thoracic trouble, take pains to mark out with a pencil the lower limits of the lungs and the outlines of cardiac dulness will often save themselves serious trouble. Accurate diagnosis in thoracic disease demands time, familiarity with theories and methods of physical exploration and some power of reasoning—and I am not sure that time is not the most important of these elements.

### METHOD OF PROCEDURE IN PARACENTESIS OF THE PERICARDIUM.

Much has been written with regard to the point of election for aspiration of pericardial effusion, and there has been a surprising difference of opinion. On general principles it is best to aspirate at that point at which the most perfect drainage may be obtained. There are, however, several dangers which one commonly seeks to avoid. These are: (1) Infection of the pleura. (2) Injury to the internal mammary vessels. (3) Puncture of the heart.

(1) *Infection of the Pleura.*—Under antiseptic precautions and in ordinary sero-fibrinous pericarditis there is little danger in puncturing at such a spot that the trocar or needle traverses the pleura on its way to the pericardium. This is often true even in purulent pericarditis. There are, however, cases in which puncture of a purulent pericarditis through the pleura has resulted in a serious spread of the infection. Thus in the case of Vaillard,[7] in an individual with pericardial effusion following typhoid fever, 600 cc. of greenish brown pus was withdrawn from a puncture in the fifth space about 6 cm. from the left sternal border. Two hours later there was severe pain in the lower left axilla with the rapid onset of a left-sided pleurisy which was followed by death.

It may, however, be an extremely difficult matter even in large pericardial effusions, to avoid the pleura, as has been demonstrated by the interesting observations of Delorme and Mignon. It is commonly assumed that the border of the left pleura passes the sternal margin at about the fourth space, and leaves a small area of pericardium uncovered at the sternal end of the fifth left interspace. Delorme and Mignon, however, found the left border of the pleura to be contiguous with or beneath the sternum—

In the 4th space, in 17 out of 32 cases.
In the 5th space, in 12 out of 32 cases.
In the 6th space, in 6 out of 26 cases,
or nearly one-quarter.

It is then, by no means always possible to avoid the pleura by puncturing vertically inwards at any point along the border of the sternum.

[4] Rev. de chir., Par., 1895, xv, 802.
[5] Boston M. & S. J., 1878, xcix, 389; 421.
[6] Brit. M. J., 1896, i, 717.
[7] Quoted by Delorme and Mignon, *op. cit.*, p. 1013.

(2) *Injury to the Internal Mammary Vessels.*—There is little danger of injuring the mammary vessels if one introduce the needle in any interspace at a point immediately contiguous to the sternal border or four centimetres to the left. In 30 cases Delorme and Mignon found that the distance between the sternal border and these vessels varied,

In the 4th space, from 3-20 mm.
In the 5th space, from 2-30 mm.
In the 6th space, from 3-40 mm.

(3) *Puncture of the Heart.*—The possibility of puncturing the heart should always be seriously considered; yet the danger following this accident would appear to be slight. There is record of a considerable number of cases in which the right ventricle has been punctured without serious result. In several instances, however, death has followed, as in the case of Callender[8] in which the trocar was introduced in the fourth left space. Two ounces of blood were removed; five minutes later death occurred from hemorrhage into the pericardium. The right ventricle had been perforated in the middle of its anterior surface. In Baizeau's[9] case, which is usually regarded as one of puncture of the heart, the needle was introduced in the 5th space three fingers' breadth from the sternal border. Air entered the pleura, and about 400 cc. of dark blood was obtained. Death occurred two hours afterwards. At autopsy the pleura and pericardium contained blood. Baizeau, however, expressly denies that the heart was wounded.

Shapojshnikov[10] mentions a case reported by Southey where death resulted from a wound of the heart in connection with puncture.[11]

*Position of the Heart in Pericardial Effusion.*—The only method by which we can be sure to avoid puncture of the heart is to insert the needle at a point below its lower border or outside of the apex. Despite much discussion, the relations of the heart to the chest wall in cases of large pericardial effusion are not entirely settled. It is probably true as pointed out by Rendu[12] and Ferrand[13] that in large pericardial effusions the heart, retained in place by the great vessels, remains practically in its normal position while the diaphragm descends. A much more difficult and still unsettled point, however, is the relation of the heart to the anterior chest wall. Many, especially German observers who have followed Skoda,[14] have been inclined to believe that the heart tends to fall backwards on account of its greater specific gravity. The observations of Shapojshnikov[15] suggest that this is not the rule, but that in most cases, even in very large effusions, the heart remains close to the anterior wall of the pericardial sac. This Shapojshnikov has determined to have been the case in a number of instances under his clinical care, while experimentally, after injection of the largest possible quantities of fluid, he found but a very thin layer between the heart and anterior wall of the pericardium. He especially emphasizes the fact that in very large effusions a friction rub may still be present.

Our second case is a striking example in point. With over 1200 cc. of fluid, the visceral and parietal pericardium were still adjacent anteriorly.

*Point of Election for Aspiration.*—In view of these facts what then is the best point at which to introduce the needle? According to West,[16] aspiration of the pericardium, while suggested by Riolan in the 17th century, was first practised in 1819 by Romero of Barcelona, but it was not until about the middle of the last century that the operation was other than of the greatest rarity.

Aran,[17] one of the earliest to practice aspiration of the pericardium, sought the spot at which the heart sounds were least audible, in the 5th space, 2-3 cm. from the outer limit of flatness.

Baizeau[18] advised aspiration in the fifth space as close as possible to the sternum, seeking thus to avoid wounding the mammary vessels and the diaphragm. He advised making a small incision at the end of the fifth space through which he introduced the trocar. While yet in the mediastinum the needle should be removed and the canula pushed inward until it is arrested by the pericardium. By the sensation communicated to the canula one should be able to determine whether it is resting upon the pericardial sac containing fluid or the right ventricle itself. This determined, the trocar is further advanced and a puncture made. At this point, however, there is unquestionably danger of puncturing the heart.

Dieulafoy[19] advises another method. The patient is raised slightly in bed and the needle is introduced in the fourth or fifth space, best in the fifth, 5 or 6 cm. from the left border of the sternum. The needle, connected with a vacuum already produced in the aspirator, is pushed very slowly upwards and inwards. After it has passed for a distance of from 3 to 6 cm., one ought to reach the pericardium or heart. As soon as the fluid begins to come the needle is swung in such a manner that it may lie in a position parallel to the ventricle.

The puncture at this point has two objections: (1) danger of puncturing the heart; (2) the certainty of puncturing the pleura.

Others have recommended puncturing below the seventh rib in the angle between it and the base of the ensiform cartilage. If, however, the diaphragm be but little depressed

[8] West: Med. Chir. Tr., Lond., 1883, lxvi, 275.

[9] Gaz. hebd. de méd., Paris, 1868, 2 s., v., 515, 562.

[10] Russk. arch. pat. klin. med. i bakt., St. Petersburg, 1896, ii, 75.

[11] The reference given by S. is "Société royale de médecine et de chirurgie de Londres, 24 Avril, 1893." Careful search has failed to reveal the original.

[12] Mém. Soc. méd. des hôp., Par., 1882, 86.

[13] Contribution a l'étude de la paracentese du péricarde, 4°, Bordeaux, 1882, 5. s, No. 3.

[14] Abhandlung über Perkussion und Auskultation, 8°, Wien, 1842, 2. Aufl., 295.

[15] *Op. cit.*

[16] Med. Chir. Tr., Lond., 1883, lxvi, 235.

[17] Gaz. d. hôp., Par., 1855, xviii, 517.

[18] Gaz. hebd. de méd., Par., 1868, 2 s., v, 515, 562.

[19] Traité de l'asp. des liquides morb., 8°, Paris, Masson, 1873, 279.

while the dilated heart lies anteriorly, as is apparently the rule, this is by no means a favorable point for aspiration and the needle may enter the heart before any fluid is obtained.

Rendu [30] asserts that if one observes a gradual descent of the diaphragm during several successive days, he may safely puncture in the mamillary line about one centimetre above the lower level of flatness which may be in the 5th, 6th or 7th space.

It is easy to imagine that a large liver might be a confusing element in such a case.

Delorme and Mignon,[31] after a careful consideration of the subject, advise the following procedure: About one finger's breadth above the lower border of the seventh cartilage, at the sternal margin, a cutaneous incision is made of about 4 cm. in length, exposing the fifth and sixth spaces. In the sixth, unless that space be too narrow to allow the introduction of a needle, and if this be the case in the fifth, or very exceptionally in the lower and internal part of the fourth space, a needle, best No. 2 Dieulafoy, is introduced at the sternal border, and passed slowly, vertically inwards. As soon as the needle has entered to the depth of the sternum, that is, about 8 mm., it is turned obliquely inwards so that the point may follow the posterior surface of the bone. After it has entered about 1 or 2 cm. the extremity is lifted slightly and the needle introduced obliquely inwards and downwards by a slow continuous movement until fluid enters. This, the authors believe, avoids as far as possible injuries to the pleura as well as to the heart.

But our second case shows how unsatisfactory this method may be, even in the presence of a very large effusion.

Shapojshnikov,[32] as the result of a careful series of observations and experiments, concludes that it is not always possible to determine the position of the heart before tapping. As a rule it is to be found close to the anterior wall of the pericardium; it does not fall downwards and backwards, as Skoda and others have believed.

If, then, one introduce the needle in the fourth or fifth left space close to the sternum, he has chosen a position in which it will be particularly difficult to avoid the heart. In very large effusions, where the diaphragm is depressed and the semilunar space occupied by flatness, Shapojshnikov advises aspiration in the sixth left space. Where this is not the case he prefers introducing the needle in the third or fourth right space close to the sternum, provided there be flatness at that point. In all cases Shapojshnikov advises an exploratory puncture with the hypodermic needle. This procedure serves two purposes, (a) to determine the character of the effusion; (b) to ascertain the position of the heart. If the fluid be purulent, aspiration should of course be replaced by incision and free drainage.

Shapojshnikov observes, with apparent reason, that with proper care there is no danger of injuring the heart by such preliminary exploration. If the physical signs be deceptive and the heart, which was supposed to lie wholly above the point selected for aspiration, be really just behind this spot, its movements will be readily felt by the hypodermic needle.

Shapojshnikov has never known pleurisy to follow such an exploratory puncture, and in justification of the measure refers to the frequency and impunity with which exploratory punctures of the liver are made in cases of suspected abscess.

* * * *

When we consider these various methods it seems to me that the procedure advised by Shapojshnikov is the most rational. It is by no means always possible to escape the pleura by tapping in the fourth or fifth left space close to the sternal border, while from every other standpoint this is a most unfavorable point, especially in view of the fact that the heart is usually close to the anterior wall of the pericardial sac. The method advised by Delorme and Mignon may fail, even in very large effusions, as has been demonstrated by our second case. If, then, we abandon the attempt to avoid the pleura, the best place to aspirate should be that in which the drainage would be most perfect. In cases where the apex cannot be localized, where there is no reason to suspect that the heart extends beyond the left mamillary line, the 6th space, at about the mamillary line, would appear to be the point of greatest advantage. It would seem best not to introduce the needle too far out, in order to allow for retraction of the sac. If it be definitely determined that the dilated heart extends beyond the mamillary line, one would then seek a point a little outside of the supposed position of the apex.

Aspiration should always be preceded by exploratory puncture. Should the heart be found directly behind the point selected for aspiration, it may well be wise to follow Shapojshnikov's recommendation and introduce the needle in the 4th right space close to the sternum, provided there be flatness on percussion at that point. If the needle be introduced downwards and to the right there ought, owing to the conformation of the right auricle, to be little danger of injuring the heart.

[30] *Op. cit.*
[31] *Op. cit.*
[32] *Op. cit.*

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# THE RELATION BETWEEN CARCINOMA CERVICIS UTERI AND THE BLADDER AND ITS SIGNIFICANCE IN THE MORE RADICAL OPERATIONS FOR THAT DISEASE.

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The relation between carcinoma cervicis uteri and the bladder manifests itself clinically in the anterior extension of the disease, thus involving the bladder, and with the necrosis of the cancerous tissue a vesico-vaginal fistula is formed. Other clinical manifestations of this relation present themselves in the frequency of accidental injuries to the bladder in the operative treatment of this disease, there having been 19 such injuries in 157 hysterectomies for carcinoma cervicis uteri in this hospital; and also in the frequency of cystitis following these operations, suggesting that the operation must be considered an accessory etiological factor in its origin.

It is evident that hysterectomy alone cures this disease in but a very small percentage of the cases, because at the time of the operation the growth either by direct invasion or by metastases has involved other parts. From a review of our cases, made in October, 1902, we found that in three-fifths of the patients admitted to this hospital the growth had extended beyond operative treatment, and that after a period of three years only 23 per cent, and after a period of five years only 11.+ per cent of the cases were free from recurrence. The extension of the growth into the parametrium with especial reference to its relation to the ureters and the bearing of this relation on the more radical operations have been studied and published,[1-3] as well as the efficiency[4] of the periureteral arterial plexus, the effect[5] of freeing the ureters from their pelvic sheath, and the results of ureteral necrosis, as well as the etiological factors[6] in the causation of ascending renal infection. These studies have taught us that it takes but a very slight involvement of the parametrium either by direct extension or metastases, for the growth to reach or extend beyond the ureters and that in these operations the periureteral arterial plexus should be preserved, whether one resects the ureters or dissects them from free, for an injured ureter is a very important etiological factor in the causation of lowered renal resistance and hence renal infection. The more one studies this disease and its invasion of the surrounding tissues the more one is impressed with the importance of a wide excision of the primary growth, especially in the early cases, for in these there is the greatest chance for a cure and the patients are in good condition to stand the more radical operations. The high percentage of local recurrences also shows the necessity of this procedure.

The object of this paper is to see what may be learned from anatomical, experimental and clinical studies as to the indications and feasibility of sacrificing portions of the bladder in these more radical operations.

## Relation between the Cervix Uteri and the Bladder under Normal Conditions.

The following observations were made in order to determine the relation between the cervix and the bladder in different positions of the uterus.

Case I.—Nullipara. Age 27. Gyn. No. 11,151. Patient complained of pain in the right side and backache; both kidneys were found to be freely movable, the right more so than the left; and the uterus was in retroposition and situated to the right of the median line. In order to determine the source of the pain a cystoscopic examination was made and both ureters were catheterized and fluid injected into them in order to see if the pain caused by the injection of this fluid was the same as that from which the patient suffered, thus indicating whether the pain was renal in origin or not, as has been described by Dr. Kelly.[7] The patient was first examined in the Sims' posture,[8] with slight elevation of the table, the bladder dilated well on removal of the obturator from the cystoscope. The urethra was found to be 3.8 cm. long and the distance from the external urethral orifice to a line drawn between the two ureteral orifices was 5.8 cm. and the ureteral orifices were 2.4 cm. apart, and in this position apparently were equally distant from a line bisecting the pelvis. The outside of the cystoscope had been marked in centimeters and half centimeters so that the distance from the external urethral orifice to various parts of the bladder could be read directly on the instrument by pushing the cystoscope into the bladder until the end reached the part to be measured. The distance between the two orifices was measured by swinging the end of the cystoscope from one orifice to the other and determining how many diameters of the cystoscope the orifices were apart. Other methods of measuring these distances have been described by Dr. Kelly.[9] The distance from the external urethral orifice to the cervix, which in this position was found to the left of the median line instead of the right, as in the dorsal position, was measured with a uterine sound and found to be 6.2 cm. The patient was then examined in the knee-breast posture and similar measurements taken and both ureters catheterized. In this position the cervix was found to be 7.5 cm. from the external urethral orifice instead of 6.2 cm. as found in the Sims' posture. On making a bimanual pelvic examination with the patient in the dorsal position the uterus was found in retroposition, to the right of the median line and freely movable, and by placing traction forceps on the cervix, it was possible to draw the cervix almost down to the vulvar orifice and push it in various portions of the pelvis, yet these positions, unless extreme, did not appreciably affect the trigonum of the bladder or the ureters, as

could be easily determined by the pelvic examination. The trigonum and ureters were relatively immovable as far as the fixed structures of the pelvis were concerned, and the relation of the uterus to these structures was dependent on the position of the uterus in the pelvis. See Fig. I, which is a diagrammatic representation of the findings in this case.

CASE II.—Para I. Age 44. Gyn. No. 11,133.

*Diagnosis.*—Very large dermoid cyst of the right ovary, densely adherent to the uterus and dragging the uterus out of the pelvis so that the cervix was pulled to the right of the median line and situated 11 cm. from the external urethral orifice.

Bladder was examined in the knee-breast posture and found to be only very slightly displaced by the tumor, as indicated in Fig. II, emphasizing that the relation between the uterus and the ureters and trigonum is dependent on the position of the uterus in the pelvis and that displacements of the uterus unless extreme change but very little the relation of the ureters and trigonum of the bladder to the fixed pelvic structures. I have made similar observations and measurements in the Sims' and knee-breast postures of six other cases and they all showed that the relation of the cervix to the ureters and trigonum of the bladder was altered by the position of the uterus in the pelvis.

These relations were studied still more satisfactorily in the pelvis of a multipara a few hours after death. Catheters were inserted in the ureters from above and the bladder was opened so that the trigonum could be observed. A bimanual examination was now made with one hand in the pelvis and the other in the vagina. The uterus was displaced by pulling it up in the pelvis, drawing it down, and displacing it to the right and left side. While extreme displacement in any direction would also displace the ureters and trigonum, one could see that the relation between the cervix and these structures was dependent on the position of the cervix in the pelvis.

The surface of the cervix rests against the posterior surface of the bladder and the two organs are united to each other with fibrous and adipose tissue, which allows of some play between them and permits of an easy separation of the two organs. The area of the bladder attached to the cervix is situated posterior to the trigonum, namely, that portion of the bladder which is relatively mobile as compared with the trigonum. The size of the vesical area varies in different cases, and with the position of the uterus in the pelvis and degree of distension of the bladder. When the uterus is in anteposition the uterus may rest against the bladder for a considerable distance, as shown in Fig. III; on the other hand, when the uterus is in retroposition this area may be much smaller, as shown in Fig. IV. Also in the distended bladder, this area is greater than in the contracted bladder, for as the bladder distends, the uretero-vesical peritoneal fold is pushed up and a greater portion of the bladder lies in contact with the uterus, while the reverse takes place when the bladder contracts. As has been stated, the uterus is attached to the bladder, posterior to the trigonum and in the different positions of the uterus it is the portion of the bladder between the trigonum and the cervix which helps adapt itself to these positions of the uterus. The distance between the cervix and the ureteral orifices may be but 3 or 4 mm. in one position and when the uterus assumes another position this portion of the bladder and vagina will stretch and the distance may be 1.5 or 2 cm. (see Fig. I), or even as great as 4.5 cm. (Fig. II), and yet the trigonum has been but very slightly altered by these changes. A result of these studies is well shown in Fig. IV, which is a reconstruction made from cross sections of a woman's pelvis where the uterus was in the right side of the pelvis in adherent retroposition, and one can see that both ureters are similarly situated as far as the fixed pelvic structures are concerned and that the relation between the cervix and trigonum and ureters is dependent on the position of the uterus in the pelvis and as the uterus in this case is in the right side of the pelvis, in retroposition, only a small part of the bladder is attached to the cervix and the cervix is much nearer the right than the left ureter and is situated posterior to the right side of the trigonum so that the middle of the cervix is directly back of the right ureteral orifice.

### RELATION BETWEEN THE GROWTH AND THE BLADDER.

The cervix rests against the posterior bladder wall and as soon as the growth extends through this portion of the cervical wall, it is in contact with the bladder. On the other hand the rectum does not become involved as readily, for the *cul de sac* is situated between the cervix and the rectum (Fig. III). The rectum can be directly invaded by the growth only when the cervix becomes adherent to the rectum, the two layers of the *cul de sac* being thus adherent and permitting an extension of the growth from the cervix, or else the vagina may become involved and the growth reach the rectum below the cervix. Whether or not the bladder becomes involved will depend on the origin of the growth, the direction of its invasion, and also its extent. A growth beginning in the cervical canal would have to extend through the entire anterior cervical wall before it would reach the bladder (Figs. VII and VIII). It is difficult to see why in some cases the growth extends in one direction and in another case in an entirely different one. In the case represented in Fig. IX the growth is restricted entirely to the anterior wall of the cervix and, while the posterior cervical wall is compressed and displaced, it has not been involved by the growth. It becomes evident from a study of the anatomical relation between the cervix and the bladder that the bladder is soon involved in these cases, for it rests against the cervix and vagina and the growth does not have to extend far either through the cervix or vagina before it reaches the bladder. The portion of the bladder involved is apt to be that part which rests against the lower portion of the cervix, *i. e.*, where the growth is not only so apt to start but also to directly invade surrounding tissue (Figs. VIII, IX and XI). This portion of the cervix is also unfortunately the part nearest the ureters, and here it takes but a very slight extension anteriorly to involve the bladder and one laterally to involve

the ureters (Fig. XI). On the other hand, the upper portion of the cervix is not as intimately connected with the bladder and here the ureters are further from the cervix, and also the growth may not be as extensive at this level, for it is usually further from the starting place. On this account both the bladder and the ureters may not be involved at this level until late in the extension of the disease (Fig. X; compare with Fig. XI).

### Effect of the More Radical Operations on the Bladder.

In hysterectomy for carcinoma cervicis uteri, not only is the entire uterus removed, but also a portion of the vagina. The amount of the latter removed varies with the extent of the disease and also with the operator, some operators removing more than others. The posterior surface of the bladder is exposed and injured in freeing it from the cervix and vagina. The greater the difficulty in freeing the bladder the greater the chance for injury to it, and also of leaving cancer tissue attached to the bladder wall. The area of bladder thus exposed and injured varies with the amount of bladder attached to the cervix, which has been discussed, and also with the amount of vagina removed. If one removes a cuff of vagina 2 cm. wide, the upper portion of the trigonum will usually be exposed, while a cuff 3-4 cm. wide may expose the entire base of the bladder down to the internal urethral orifice besides the portion of the bladder attached to the cervix which extends as far up on the fundus of the bladder as the utero-vesical peritoneal fold. In the specimen represented in Figs. V and IX a vaginal cuff only about 2 cm. wide was removed and yet an idea of the amount of bladder exposed may be gained by studying Figs. XIII and XIV, where one may see that almost the entire posterior surface of the bladder down to the internal urethral orifice has been exposed and injured. In this case the patient died on the 9th day from ascending renal infection and the bladder was obtained at autopsy and the illustrations made from these specimens. It becomes evident that a large portion of the bladder is exposed and injured in these operations in such a manner that the function of the bladder is interfered with and that the bladder is predisposed to infection, the amount of injury varying with the area of the bladder exposed and the amount of trauma caused in freeing the bladder, which in turn would depend on whether the bladder was adherent or not.

In freeing the bladder from the cervix, parametrium and vagina, not only are vessels going to this portion of the bladder destroyed, but vessels in the outer vesical wall are also injured, thus interfering with the nutrition of the bladder and impairing its function and predisposing it to infection.

The blood supply of the bladder is frequently injured in other ways by the operation, *i. e.*, in the ligation of large vessels, as the internal iliac or its anterior branch from which arise the vesical arteries. I am unable to see any operative advantage to be gained in the ligation of these vessels over the ligation of the uterine alone, and there is certainly this disadvantage that the blood supply of these parts must be injured, thus making them less resistant to infection.

### Experimental Work Demonstrating Some of the Etiological Factors in the Causation of Cystitis.

During the last year I have made several experiments on dogs in regard to ascending renal infection, using bouillon cultures of *Staphylococcus pyogenes aureus* as the infective agent.

I. In 8 dogs the organism was introduced into the jugular vein and the ureter of one kidney was ligated. In every instance the organism was excreted by the kidneys and obtained from the bladder. Yet in not a single instance did a cystitis develop. On the other hand, the kidney whose ureter was tied became infected, while the other organ did or did not escape, depending on the virulence of the organism, individual susceptibility, etc.

II. In 9 dogs the lower end of one ureter was resected and the ureter implanted in the bladder, and 10 cc. of a 24-hour bouillon culture of the organism was injected into the bladder with a hypodermic syringe. The dogs were killed in from 4 days to 6 weeks and renal infection occurred in 3 of the 9 cases and in these cases there was a marked stricture at the seat of the implantation. On the other hand, except for areas of infection about the silk sutures, used in the uretero-vesical implantation, the bladders were free from any evidence of cystitis except in one case, in which there was a small localized area. These experiments only emphasize that injury in addition to infection does not necessarily cause cystitis.

III. In 4 dogs one ureter was ligated and 2 to 3 cm. of it was excised between the ligature and the bladder, and the vesical end of the cut ureter was also ligated. The bladder was incised and the mucosa injured and in places removed, care being taken not to injure the ureteral orifices. A small rough stone was now placed in the bladder and the incision closed. Ten cc. of a 24-hour bouillon culture of *Staphylococcus pyogenes aureus* was injected into the bladder. One dog was killed on the 6th day. In this instance the organism was regained from the circulated blood, liver, gall bladder, urinary bladder, and both kidneys, and there was a pyonephrosis of the kidney whose ureter had been ligated. Apparently, a general infection had arisen from the bladder, and the kidney whose ureter had been tied became the seat of a pyonephrosis. The other three dogs were killed at the end of two or five days and all cultures except those from the bladder were sterile. Even in these cases the bladder withstood very well the infection and rough stone. There was some evidence of cystitis, but less than I had supposed would occur. These experiments have been previously referred to in an article published on ascending renal infection.[4]

IV. In 5 dogs the blood vessels of the bladder were injured by ligating the main vesical artery, which arises from the uterine arteries, and also by tearing some of the vessels on the surface of the bladder by means of a fine pair of forceps; 10 cc. of a 24-hour bouillon culture of *Staphylococcus pyo-*

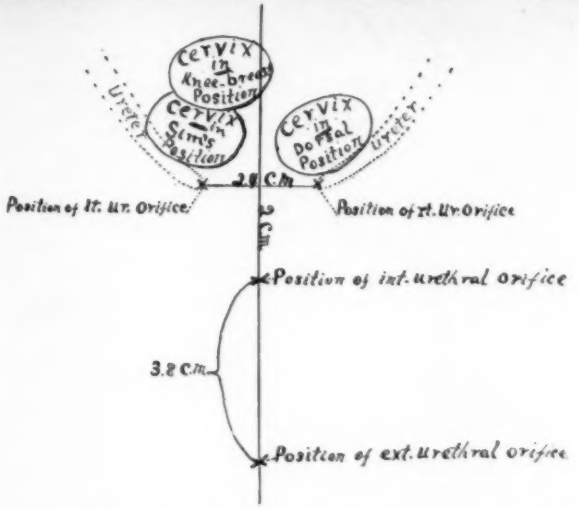



FIG. I.—RELATION BETWEEN THE CERVIX AND THE TRIGONUM OF THE BLADDER IN DIFFERENT POSITIONS OF THE UTERUS. × 7/10.

Nullipara, age 23. Uterus in retroposition, in right side of the pelvis, when the patient was in the dorsal position. Cystoscopic examinations were made in the Sims and knee-breast postures and the length of the urethra and dimensions of the trigonum were determined in these positions. The ureters were catheterized with silk bougies and the position of the cervix was noted in the Sims, knee-breast and dorsal postures of the patient. The catheterized ureters could easily be palpated and relation of the cervix to them was determined.

This illustration is a diagrammatic representation of the findings in the case, as marked out on the anterior vaginal wall (patient in knee-breast posture). One can see that while the posture of the patient changed the position of the uterus (which was freely movable) in the pelvis, that the position of the uterus did not affect the trigonum of the bladder or ureters and that the relation between the cervix and these structures was dependent on the position of the uterus in the pelvis.

FIG. IV.—RECONSTRUCTION, SHOWING THE RELATION BETWEEN THE UTERUS AND THE BLADDER FROM CROSS SECTIONS OF THE PELVIS OF A MULTIPARA 30 (?) YEARS OLD. × 1. (FROM SPECIMEN IN ANATOMICAL LABORATORY, JOHNS HOPKINS MEDICAL SCHOOL).

The uterus was adherent in retroposition in the right side of the pelvis.

A, B, C, D represents the relatively small area of the bladder attachment when the uterus is in retroposition. The line CD represents the junction of the cervix and vagina.

The right ureteral orifice is directly in front of the cervix, while the left orifice is lateral to the cervix, emphasizing that the relation between the uterus and the ureters and trigonum of the bladder is dependent on the position of the uterus in the pelvis.

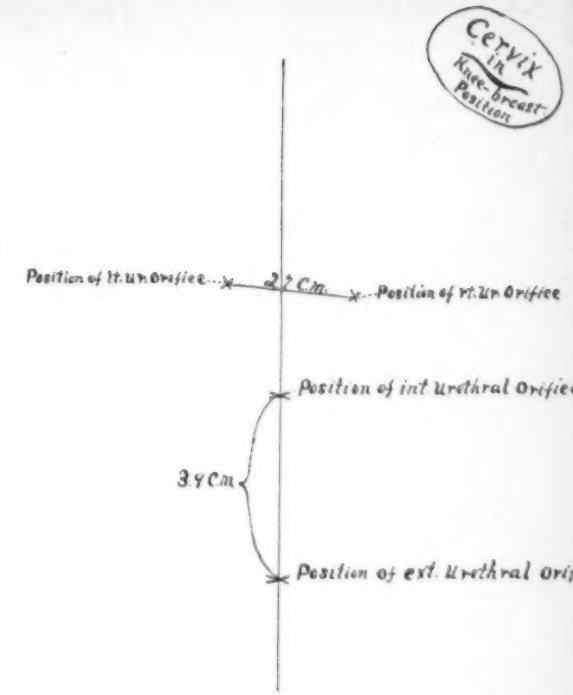

Cervix in Knee-breast Position
Position of lt. ur. orifice
2.7 C.m.
Position of rt. ur. orifice
Position of int. urethral orifice
3.4 C.m.
Position of ext. urethral orifice

FIG. II.—RELATION BETWEEN THE CERVIX AND THE TRIGONUM OF TH BLADDER IN UPWARD DISPLACEMENTS OF THE UTERUS. × 7/10.

Para 1, age 44. Uterus drawn upwards by a very large ovarian cy which was adherent to the uterus; cervix could just be palpated and w situated far to the right of the median line when the patient was in t dorsal position. A cystoscopic examination was made, in knee-bree posture, and the length of the urethra and dimensions of the trigonu were determined. This illustration is a diagrammatic representation the findings in the case, as marked out on the anterior vaginal wa (patient in knee-breast posture). One may see that the extreme displac ment of the uterus has only slightly affected the trigonum of the bladd and that the relation between the two is dependent on the position the uterus in the pelvis.

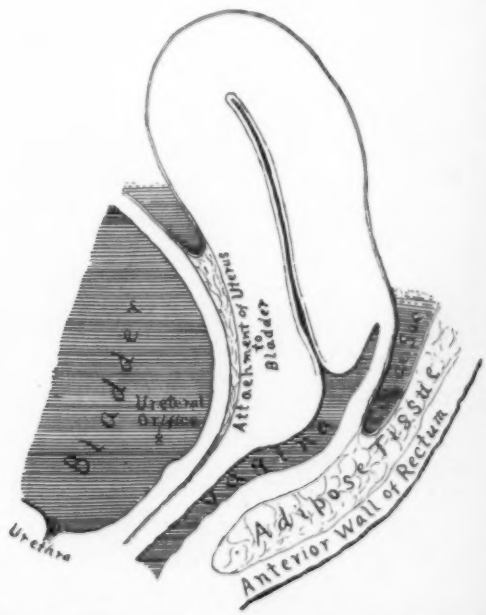



FIG. III.—SAGITTAL SECTION SHOWING THE RELATION BETWEEN THE UTERUS AND BLADDER. SLIGHTLY REDUCED.

From autopsy specimen. Pelvic contents removed in one mass and th hardened in formalin. The uterus is in anteposition and so rests again the bladder for a considerable distance.

The bladder is purposely represented as being pulled away from t cervix in order to bring out the relatively loose attachment between t two organs, indicating that under normal conditions they may be eas separated.

One can see that the growth does not have to extend far in order reach the bladder and also that when the entire uterus and a portion of t vagina are removed the bladder wall has been exposed over a large ar

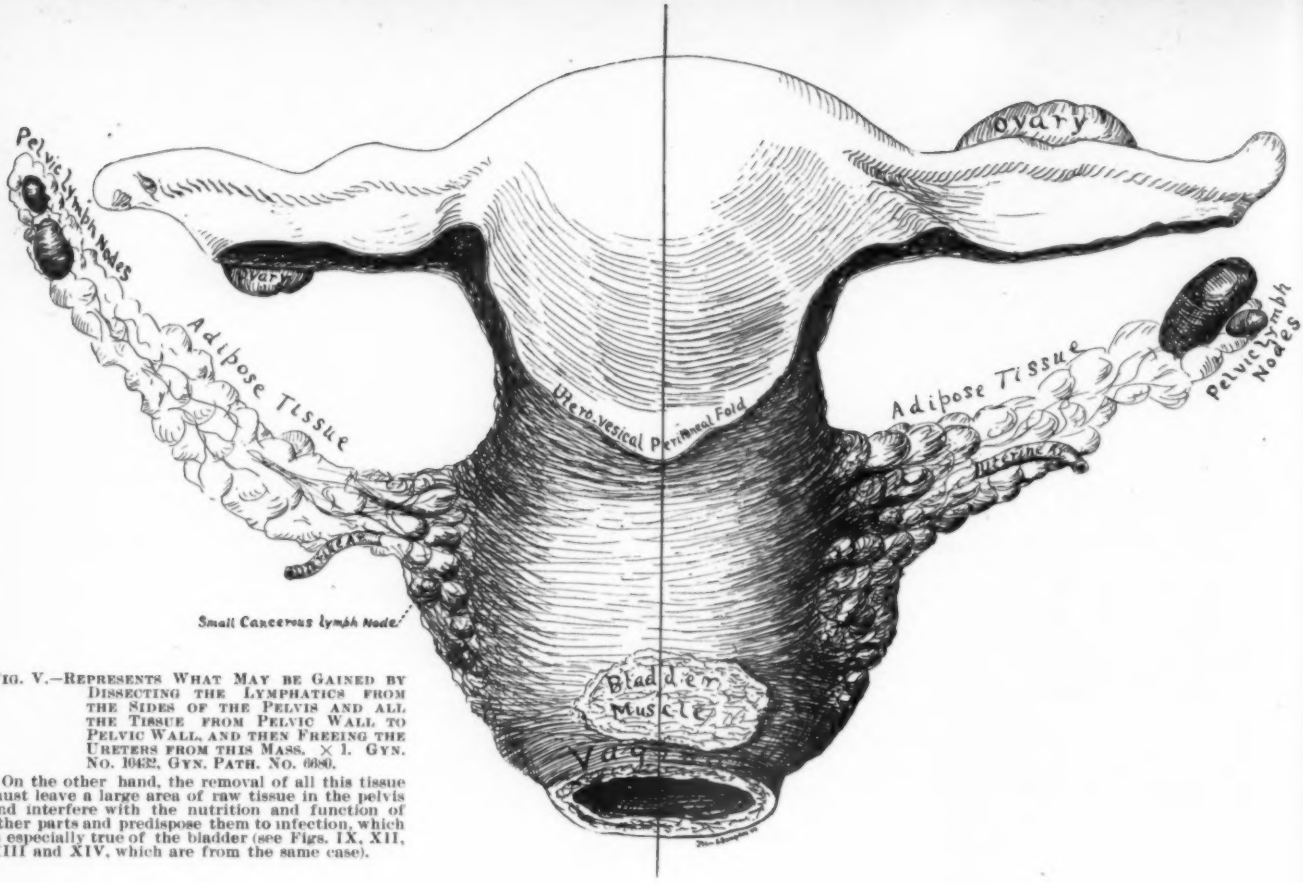
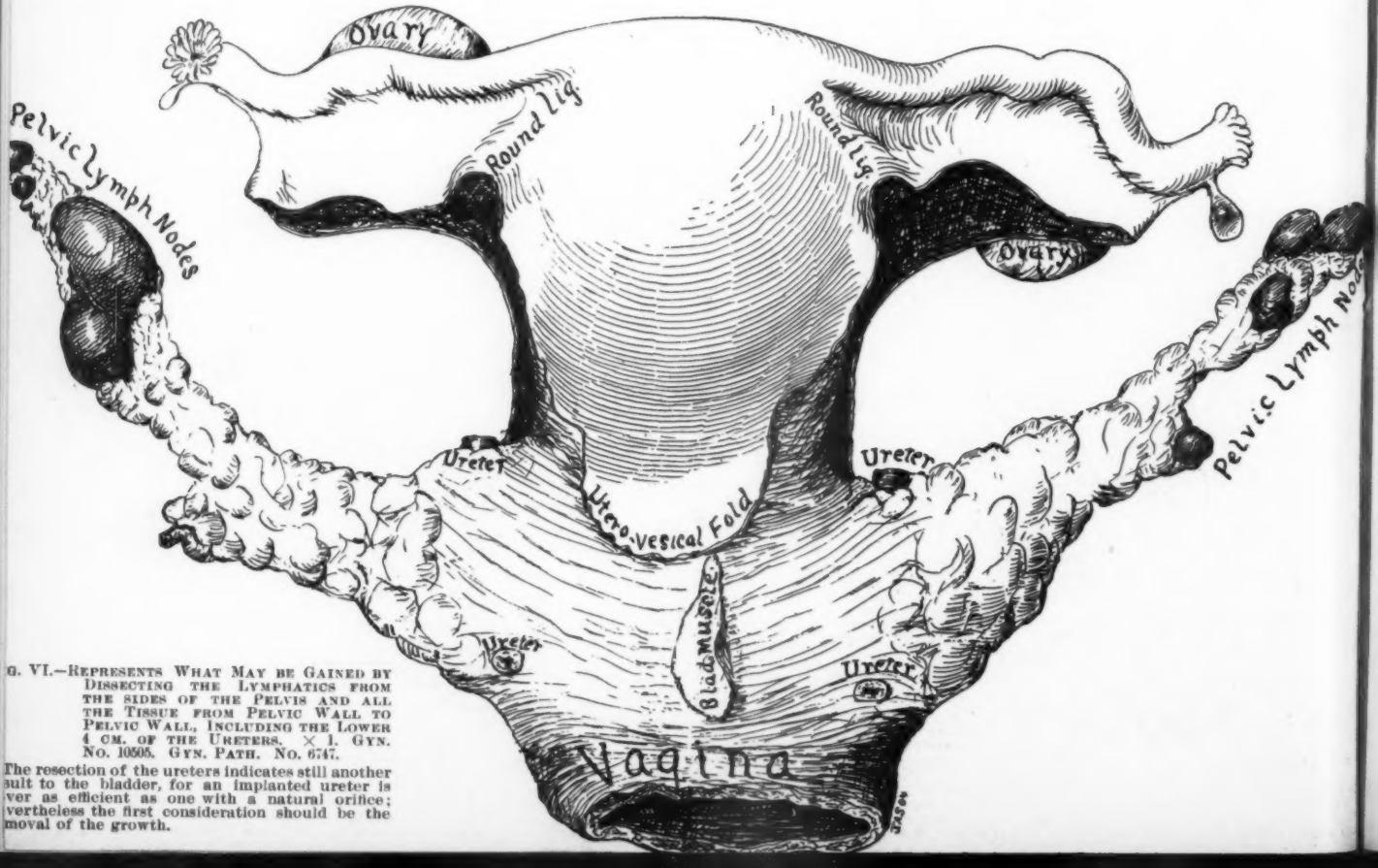



FIG. V.—REPRESENTS WHAT MAY BE GAINED BY DISSECTING THE LYMPHATICS FROM THE SIDES OF THE PELVIS AND ALL THE TISSUE FROM PELVIC WALL TO PELVIC WALL, AND THEN FREEING THE URETERS FROM THIS MASS. × 1. GYN. NO. 10432, GYN. PATH. NO. 6080.

On the other hand, the removal of all this tissue must leave a large area of raw tissue in the pelvis and interfere with the nutrition and function of other parts and predispose them to infection, which is especially true of the bladder (see Figs. IX, XII, XIII and XIV, which are from the same case).




G. VI.—REPRESENTS WHAT MAY BE GAINED BY DISSECTING THE LYMPHATICS FROM THE SIDES OF THE PELVIS AND ALL THE TISSUE FROM PELVIC WALL TO PELVIC WALL, INCLUDING THE LOWER 4 CM. OF THE URETERS. × 1. GYN. NO. 10505. GYN. PATH. NO. 6747.

The resection of the ureters indicates still another sult to the bladder, for an implanted ureter is ver as efficient as one with a natural orifice; vertheless the first consideration should be the moval of the growth.

FIG. VII.—SAGITTAL SECTION OF CANCEROUS UTERUS, SHOWING THE RELATION OF THE GROWTH TO THE BLADDER. SLIGHTLY REDUCED. GYN. NO. 10805. GYN. PATH. NO. 6767. FROM THE SAME SPECIMEN AS THE ONE REPRESENTED IN FIG. VI.

The growth in this specimen has not extended through the cervical walls and has invaded the anterior and posterior walls about equally. Notice the bladder attachment, representing the amount of bladder exposed and injured in these operations.

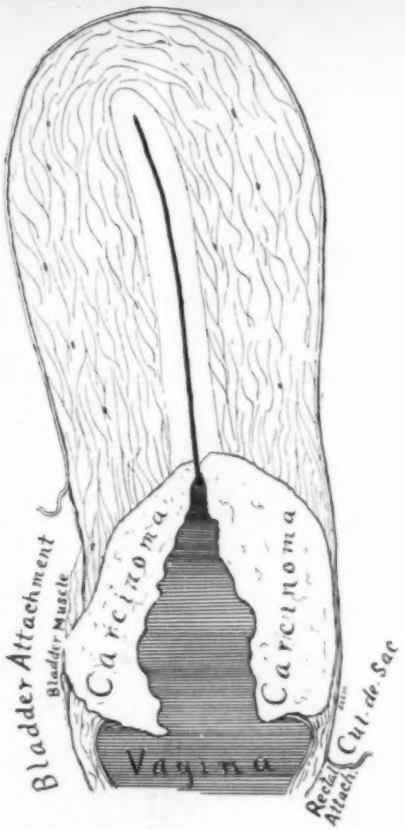



FIG. VIII.—SAGITTAL SECTION OF CANCEROUS UTERUS, SHOWING THE RELATION OF THE GROWTH TO THE BLADDER. SLIGHTLY REDUCED. GYN. NO. 9903. GYN. PATH. NO. 6103.

In this instance the growth, while involving both the anterior and posterior walls of the cervix, has extended beyond the anterior wall and is invading the bladder muscle (see Fig. XI). The cul-de-sac acts as a natural protection against the extension of the growth posteriorly.

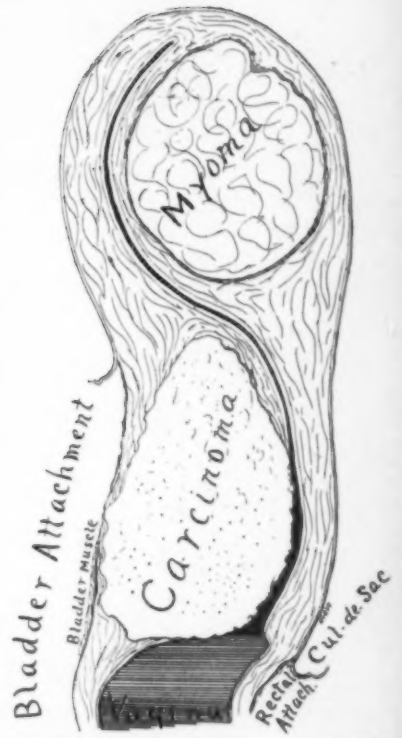



FIG. IX.—SAGITTAL SECTION OF CANCEROUS UTERUS, SHOWING THE RELATION OF THE GROWTH TO THE BLADDER. SLIGHTLY REDUCED. SAME CASE AS ONE REPRESENTED IN FIG. V.

The growth is restricted to the anterior cervical wall, and is beginning to invade the bladder anteriorly. The posterior wall of the cervix has been compressed but not invaded by the growth. A small myoma is situated in the fundus. For the injury done to the bladder by this operation, see Figs. XII, XIII and XIV.

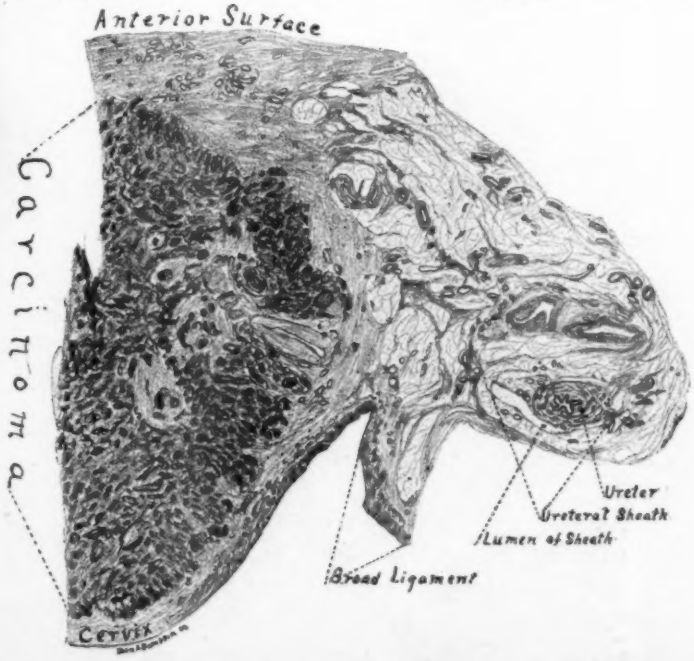



FIG. X.—SHOWS THE RELATION BETWEEN CARCINOMA CERVICIS UTERI AND THE BLADDER. UPPER PORTION OF THE CERVIX. × 2¼.

Transverse section of the right parametrium and one half of the cervix, from a specimen where both ureters were resected. Same case as one represented in Fig. VIII. Although the bladder is involved at a lower level, here it is free. (See Fig. XI.)

FIG. XI.—SHOWS THE RELATION BETWEEN CARCINOMA CERVICIS UTERI AND THE BLADDER. LOWER THIRD OF THE CERVIX. × 2¼.

From the same specimen from which Fig. X was drawn, only in the lower third of the parametrium.

At this level the growth has invaded the bladder and laterally has extended out to the ureters which unfortunately are nearer the cervix at this level than higher up in the parametrium, as in Fig. X. Notice the

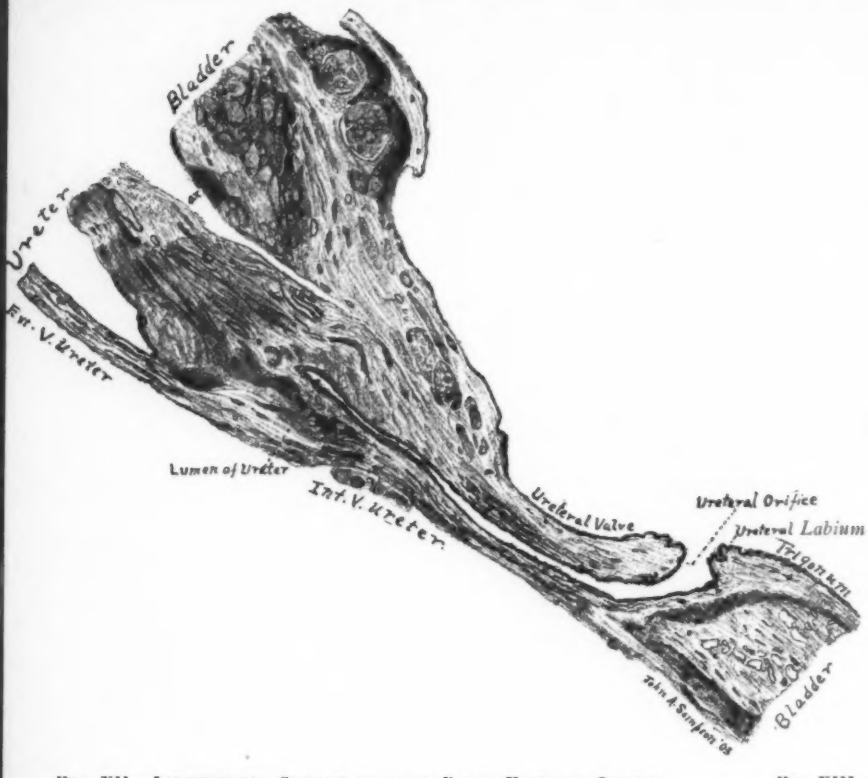



FIG. XII.—LONGITUDINAL SECTION THROUGH RIGHT URETERAL ORIFICE, FROM A PATIENT DYING OF UNILATERAL (RIGHT) ASCENDING RENAL INFECTION. × 4. SAME CASE AS ONE REPRESENTED IN FIGS. V AND IX.

Notice how thin the bladder wall is posterior to the lumen of the ureter. The infection has apparently extended through the bladder wall, A, B, C, D, thus involving the ureter. The vesical portion of the ureter became involved and was converted into a sinus so that pressure over the bladder forced the bladder contents through the ureter into the pelvis of the kidney.

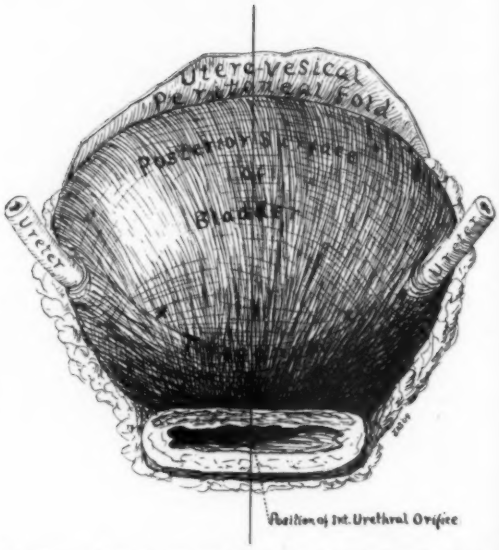



FIG. XIII.—POSTERIOR SURFACE OF THE BLADDER, SHOWING THE AMOUNT OF BLADDER EXPOSED AND INJURED IN THESE OPERATIONS. SLIGHTLY REDUCED.

Same case as represented in Figs. V and IX. The entire posterior surface of the bladder has been exposed and injured beginning above at the utero-vesical peritoneal fold and extending below almost to the internal urethral orifice and laterally beyond the entrance of the ureters into the bladder. It is little wonder that the bladder is so injured that it is unable to resist infection. (See Figs. XII and XIV, from the same case.)

The probable position of the ureteral orifices are represented by *x*, *x*. The vagina is represented cut transversely.

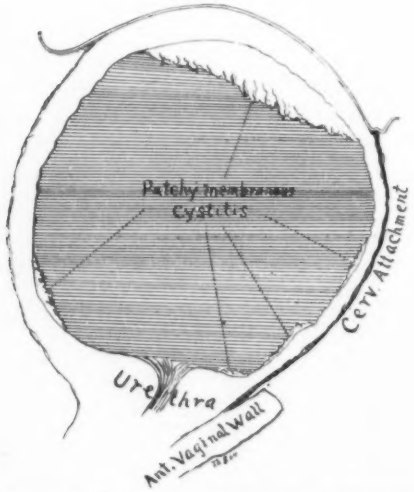



FIG. XIV.—SAGITTAL SECTION OF BLADDER FROM PATIENT DYING OF ASCENDING RENAL INFECTION FOLLOWING ONE OF THESE OPERATIONS. SLIGHTLY REDUCED. SAME CASE AS REPRESENTED IN FIGS. V, IX, XII, XIII.

The bladder area exposed by the removal of the uterus and portion of the vagina is shown. A patchy membraneous cyst was found at autopsy and the areas corresponded to the portions of the bladder which would rest against the retention catheter which was placed in the bladder in order to keep it empty. I think that the mushroom catheter acted as a foreign body, aggravated the bladder infection, and may have been responsible for the renal infection and death of the patient.

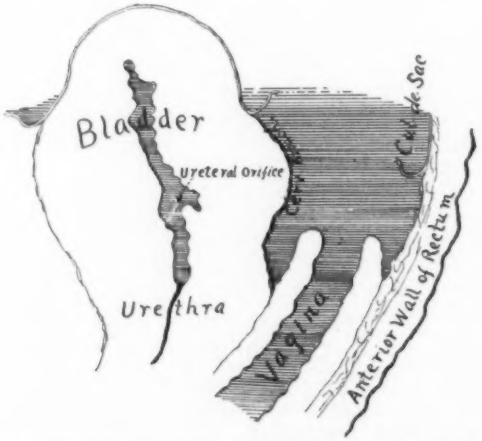



FIG. XV.—SAGITTAL SECTION OF BLADDER FROM PATIENT DYING SIX DAYS AFTER ONE OF THESE OPERATIONS. CAUSE OF DEATH NOT DETERMINED AT AUTOPSY. GYN. NO. 10084. GYN. PATH. NO. 6284.

The bladder was found to be contracted but free from cystitis. As one can see in the contracted bladder, the walls are thicker and there is less of the raw area exposed than in the distended bladder, as in Fig. XIV. Its nutrition should also be better. It would seem best to keep the bladder empty after these operations. A retention catheter is dangerous, acting as a foreign body, and it is also likely to become occluded or pushed too far in the bladder. Frequent catheterizations are better, and if cystitis develops, make a vesico-vaginal fistula.

*genes aureus* was injected into the bladder. These dogs were killed in from 2 to 10 days. In every instance the organism was regained from the bladder but not from the kidneys. In two instances there was some evidence of slough of the bladder and in four of the five cases, marked evidence of cystitis. We have then in the interference of the blood supply of the bladder a means of lowered local resistance, which must be considered an important etiological factor in the causation of experimental cystitis. Another important accessory etiological factor in the causation of experimental cystitis is retention of urine, which may be accomplished by ligating the urethra or penis of the animal. This has been shown by many who have experimented along these lines.

### CLINICAL CASES DEMONSTRATING INJURY TO THE BLADDER AS A RESULT OF HYSTERECTOMY FOR CARCINOMA CERVICIS UTERI.

The 19 instances of accidental injury to the bladder in 157 hysterectomies for carcinoma cervicis uteri emphasize the close anatomical relation between the two organs and that the extension of the disease soon involves the bladder, so that the separation of the bladder from the growth results in injury to the bladder which may manifest itself as a vesical fistula, recognized either at the time or afterwards.

The frequency of cystitis following these more radical operations is another indication of the close relation between carcinoma cervicis uteri and the bladder and indicates that as a result of the operation the bladder is left in a condition of lowered local resistance and that this condition is responsible for the cystitis which may later develop, as was maintained by Wertheim [9] in the report of his second series of 30 cases. Krönig [11] has carefully described the technique of closing the raw areas caused by these operations and emphasizes the importance of covering the posterior surface of the bladder by bringing down the utero-vesical peritoneal flap and suturing it to the anterior vaginal wall as a means of protecting the injured bladder and thus lessening the chance for cystitis. Taussig [13] has reviewed Wertheim's cases and demonstrated the importance of retention of urine as an etiological factor in the causation of cystitis and that in these more radical operations this is especially likely to occur. He calls attention to the fact that ganglia and nerves are found in the parametria of these cases and that their removal may interfere with the function of the bladder and so give rise to the retention of urine. Kolischer,[8] in addition to the other views already mentioned, as, injury to the bladder, blood supply, etc., adds another, *i. e.*, in freeing the ureters certain trophoneurotic disturbances occur which predispose the bladder to cystitis. Bäisch [1] considers that the main factors in the causation of the cystitis following these operations results from injury to the nerves and blood supply of the bladder. He advocates catheterization followed by bladder irrigation as prophylactic measures in the avoidance of this cystitis.

In order to make a positive diagnosis of cystitis two things must be done: first, a cystoscopic examination must be made and the inflamed bladder seen; secondly, cultures must be taken and the organism causing the infection obtained. These two steps are essential, for an inflamed-appearing bladder may not be infected, and positive cultures obtained from the urine may come from an infected kidney and the bladder may be normal or the organisms may be excreted by the kidneys and appear in the urine without causing any harm to either kidney or bladder.

I have followed the bladder condition in sixteen cases where hysterectomy for carcinoma cervicis uteri has been done. In 14 of these cases both cystoscopic examinations and urine cultures were taken and in the other 2 cases the patients died, one on the ninth day and the other on the seventeenth day, and at autopsy the cause of death was found to be ascending renal infection. The ureters had been sacrificed in one but not in the other of these two cases. In 10 of the 14 cases who lived, cystitis was found to be present, as determined by cystoscopic examination and taking cultures, and in 3 of the 4 cases in which the bladder apparently escaped infection, an accidental vesico-vaginal fistula was present, which apparently prevented a cystitis, for cultures taken in two of these cases showed colon bacillus in large numbers. In 12 of the 16 cases cystitis occurred, resulting in renal infection and death in 2 cases. In all the cases but one the raw areas were covered with peritoneum, and in that one case it was necessary to leave on clamps and pack with gauze in order to control hemorrhage. In these cases the utero-vesical peritoneal fold was sutured to the anterior vaginal wall and the entire denuded vesical wall was protected by peritoneum. In addition, the posterior vaginal wall was sutured to the recto-uterine peritoneal fold, thus covering in the raw tissue anterior to the rectum. The pelvis was drained by two small gauze drains extending under the peritoneum on each side and out through the vaginal opening. Yet these cases did not escape cystitis. Realizing that retention of urine was an important etiological factor in the causation of cystitis I used a retention mushroom catheter in four cases; in all four cases cystitis developed, resulting in ascending renal infection and death in two, and in one of these there was a patchy, membranous cystitis, the patches corresponding to the parts of the bladder which came in contact with the catheter when the bladder collapsed (see Fig. XIV). Apparently the catheter was responsible for the severity of the cystitis, for it may soon become covered with urinary salts acting as a foreign body (stone) in the bladder. Another criticism against the retention catheter is that it is apt to become occluded or pushed too far in the bladder, and one can never tell whether or not it is doing what it is supposed to do, that is, keeping the bladder empty by draining the urine away as fast as it comes to the bladder.

Frequent catheterization was tried, *i. e.*, every three to four hours, in the next nine cases, but cystitis developed in eight of the nine cases. In two of these cases the bladder was irrigated three times a day, and in four cases every three or four hours after catheterization.

Why does cystitis occur in these cases? I have been unable to prevent it by covering the injured bladder with peri-

toneum and also by preventing retention of urine by means of the retention catheter or frequent catheterization, and in six cases in which bladder irrigations were tried as a prophylactic measure the cystitis was not avoided. I cannot see how that dissecting free the ureters, aside from the fact that more of the bladder is exposed and surrounding tissue injured, can be considered an important etiological factor, for I followed the condition of the bladder in three cases in which an abdominal hysterectomy was done for cancer of the body of the uterus, the entire uterus with a vaginal cuff having been removed. Cystitis occurred in two of the three cases and yet the ureters were not seen during the operation. On the other hand, abdominal supravaginal hysterectomies for myomata, pelvic inflammatory conditions, etc., are very rarely followed by cystitis. The difference between these operations and the more radical operations for carcinoma cervicis uteri must be considered the main accessory etiological factors in the causation of the cystitis, and are as follows:

1. The large area of the bladder exposed and injured in removing the cervix with parametrium and also portion of the vagina. (Figs. XIII and XIV).

2. Interference with the blood supply of the bladder, caused by ligating vessels giving rise to vesical arteries; freeing the bladder, thus cutting off vessels going to it; and the injury of vessels in the bladder wall.

3. Interference with the function of the bladder, it having been injured in freeing it, its blood supply having been interfered with, some of its natural supports removed, and its nerves and ganglia destroyed. This interference with its function may manifest itself in the inability to void urine. On the other hand, in one patient incontinence was present, there being no ureteral or vesical fistula. In other cases the patient may void urine, but there may be a large residual of urine left in the bladder. In one of the above cases this was as great as 300 cc.

Organisms may gain access to the bladder in various ways:

1. They may be present in the bladder at the time of the operation. They were present in one of the above cases, although there was no evidence of cystitis at the time.

2. They may pass through the injured bladder wall through the fundus or trigonum, or along the bared ureters if dissected free or resected and implanted in the bladder.

3. In the process of catheterizing the bladder, organisms may be carried in.

4. Organisms may be carried down from the kidneys or conveyed to the bladder by the circulating blood.

It becomes evident that the relation between carcinoma cervicis uteri and the bladder is a very important one on account of the early invasion of the bladder and also because of the likelihood of post-operative cystitis with its accompanying danger of ascending infection.

The next question which must be considered is the bearing of the above on these more radical operations.

### The Bearing of the Relation between Carcinoma Cervicis Uteri and the Bladder on the More Radical Operations for that Disease.

A study of specimens from these more radical operations emphasizes the importance of a wide excision of the primary growth, and that the bladder anteriorly and the ureters laterally may soon be involved in the extension of the disease. A study of the bladders obtained at autopsy from those cases who have died after these more radical operations, as well as the clinical histories of those who survive, shows how frequently cystitis follows these operations and that the danger of ascending renal infection is a very important consideration.

A very instructive feature associated with these cases is that an accidental vesico-vaginal fistula was present in three of four cases in which cystitis apparently did not develop. The presence of a vesico-vaginal fistula meant that intravesical tension was absent and that the injured bladder was put at rest and cystitis did not develop, or was much less severe. We realize that the formation of a vesico-vaginal fistula is the best means we have of treating severe cystitis. The best surgical treatment for infection in any part of the body is free incision and drainage, together with rest of the part diseased, and that is what a vesico-vaginal fistula does for an infected bladder. Its significance here is most important. On account of the proximity of the bladder to the uterus the growth does not have to extend far anteriorly to involve the bladder.

*The avoidance of injury to the bladder means in many instances a return of the growth and cystitis, with the danger of ascending renal infection. The wide excision of the growth with any portion of the bladder adherent, means a higher percentage of cures and the probable avoidance of cystitis and ascending renal infection.*

In cases in which the bladder is not involved by the growth it is not necessary to sacrifice a portion of the bladder. In these cases all raw areas should be covered with peritoneum. The utero-vesical peritoneal fold should be sutured to the anterior vaginal wall and the recto-uterine to the posterior vaginal wall. There is no advantage to be gained in the removal of a long portion of the vagina, unless it is involved by the growth, and there is this disadvantage: that the more vagina removed, the greater the injury to the bladder. A wide excision of the tissue surrounding the upper portion of the vagina is more important. Afterwards the patient should be catheterized every three to four hours, and the bladder irrigated after each catheterization, and at the first suggestion of cystitis, as seen by pus in the urine, the bladder should be examined and if there is evidence of a marked cystitis a vesico-vaginal fistula should be formed.

A satisfactory cystoscopic examination may be made with the patient in the Sims' posture,[8] and if evidence of cystitis is seen, the opening into the bladder may be made as follows: The handle of the cystoscope is pushed towards the symphysis so that the end of the cystoscope causes the anterior vaginal wall to bulge at a point just posterior to the internal urethral orifice. This bulging point is opened with a knife and the

incision enlarged posteriorly with scissors. This may be done without even a local anesthetic, for these extensive operations apparently destroy the sense of pain over this portion of the vagina and bladder. I have done this in one instance with apparently most satisfactory results.

Under normal conditions the sensibility of the vagina to pain and touch varies in different individuals. In some cases the entire vagina down to the vulvar orifice seems almost insensitive to pain, so much so that such operations as anterior and posterior colporrhaphies may be done without even a local anesthetic and without causing any severe pain to the individual. On the other hand, in other individuals the vagina is quite sensitive to pain. The vulva is always very sensitive and one must be very careful not to pinch or cut it in these operations. I have done several minor vaginal operations without the use even of a local anesthetic, and find that where indicated, and in suitable cases these operations may be done with but very little discomfort to the patient. I refer to such operations as anterior and posterior colporrhaphies and the making and closure of vesico-vaginal fistulæ. I do not know why there is this great difference in cases. It is not always due to child-birth, for I have found instances among nullipara where the vagina was relatively insensitive. Up to this date I have tested the sensibility of the vagina in over seventy-five cases, by exposing it and pinching it with forceps or pricking it with a right-angle tenaculum. While in many cases the vagina is so insensitive to pain that pieces of vaginal mucosa may be excised and the raw areas closed with sutures, as in anterior and posterior colporrhaphies, and the pain and discomfort are so slight that the patient will not cry out and frequently not even wince; nevertheless, in some cases such operations would give rise to great pain and torture. The interesting feature of this relative insensibility of the vagina is that it is apparently rendered still less sensitive by these more radical operations, so that vesico-vaginal fistulæ may be made and closed without the use of an anesthetic and without causing the patient any severe pain. In only one instance have I intentionally made a vesico-vaginal fistula for cystitis following these operations and the parts were so insensitive that the patient did not know when it was done. The restoration of what little sensibility there is in the vagina must be very slow, for I closed a vesico-vaginal fistula following one of these more radical operations six months after the operation, yet the closure of the fistula did not cause the patient a particle of pain.

### CONCLUSIONS.

I. The cervix rests against the bladder posterior to the trigonum and under normal conditions the two organs are but loosely attached to each other so that their separation is easily accomplished. The size of the vesical area varies in different cases, and also with the position of the uterus in the pelvis and degree of distension of the bladder.

II. The growth in its anterior extension soon reaches the bladder, as manifested by the vesico-vaginal fistulæ resulting from the necrosis of the growth which has involved the bladder and accidental openings made in the bladder in freeing that organ from the cervix during hysterectomy for carcinoma cervicis uteri.

III. Freeing the uterus, parametrium, and upper portion of the vagina from the bladder exposes a large area of the bladder wall, extending from above at the utero-vesical peritoneal fold to a point below, which varies with the amount of the vagina removed, but usually exposing a portion of or the entire trigonum. This area laterally extends beyond the entrance of the ureters into the bladder, if the ureters are resected or dissected free. There is no advantage to be gained in the removal of a long portion of the vagina unless it is involved by the growth, and the more vagina removed, the greater the injury to the bladder. On the other hand the wide excision of the tissue surrounding the upper portion of the vagina is most important.

IV. In freeing the bladder it is injured, the amount of injury varying with the difficulty experienced in freeing it, which in turn is dependent upon whether the bladder is adherent or not.

V. The blood supply of the bladder may be impaired by the ligation of large vessels from which vesical arteries may arise, and also in freeing this large bladder area all vessels going to this area are destroyed and in addition vessels in the bladder wall may be injured.

VI. Nerves and ganglia are removed or destroyed in these operations, which may be important structures in maintaining the physiological activity of the bladder.

VII. The function of the bladder is impaired by these injuries, as shown by the retention of urine or an inability to empty the bladder completely, which is apt to follow these operations.

VIII. Injuries resulting from the operation, together with the impairment of function following them, lessens the resistance of the organ, so that it is usually unable to resist infectious organisms which may gain access to the bladder, and cystitis results. In addition to the avenues available for the entrance of organisms into the bladder a new one now presents itself, viz.: that is, the injured bladder wall.

IX. Cystitis occurred in 12 of 16 of these cases where I have followed the bladder conditions after operation, and in two of the twelve cases it resulted in renal infection and death. In three of the four cases in which cystitis apparently did not occur an accidental vesico-vaginal fistula was present, which apparently prevented a cystitis, for cultures taken in two of these cases showed colon bacilli in large numbers.

X. The best surgical treatment for infection in any part of the body is incision and *free* drainage, together with rest of the part diseased; and apparently this is what a vesico-vaginal fistula does for these cases.

XI. It seems best that following these operations the bladder should be catheterized every three or four hours, followed by a bladder irrigation as a prophylactic means of preventing retention of urine and avoiding or lessening the severity of the cystitis, and should a severe cystitis develop as determined by cystoscopic examinations, a vesico-vaginal fistula should be

made, which may be done without even a local anesthetic, and if it does not close spontaneously it may also be closed without an anesthetic, as has been described in this article.

XII. *The excision of portions of the bladder adherent to the growth improves the chances of a cure and the presence of a vesico-vaginal fistula apparently lessens the chances of a post-operative cystitis and the danger of an ascending renal infection.*

REFERENCES.

1. Sampson: Ligation and Clamping the Ureter as Complications of Surgical Operations. American Medicine, 1902, IV, 693-700.

2. Sampson: The Importance of a More Radical Operation in Carcinoma Cervicis Uteri, as Suggested by Pathological Findings in the Parametrium. Johns Hopkins Hospital Bulletin, 1902, XIII, 299-307.

3. Sampson: The Relation between Carcinoma Cervicis Uteri and the Ureters, and Its Significance in the More Radical Operations for that Disease. Johns Hopkins Hospital Bulletin, 1904, XV, 72-84.

4. Sampson: The Efficiency of the Periureteral Arterial Plexus and the Importance of Its Preservation in the More Radical Operations for Carcinoma Cervicis Uteri. Johns Hopkins Hospital Bulletin, 1904, XV, 39-46.

5. Sampson: Complications Arising from Freeing the Ureters in the More Radical Operations for Carcinoma Cervicis Uteri, with Special Reference to Post-Operative Ureteral Necrosis. Johns Hopkins Hospital Bulletin, 1904, XV, 123-134.

6. Sampson: Ascending Renal Infection; with Special Reference to the Reflux of Urine from the Bladder into the Ureters as an Etiological Factor in Its Causation and Maintenance. Johns Hopkins Hospital Bulletin, 1903, XIV, 334-352.

7. Kelly: The Use of the Renal Catheter in Determining the Seat of Obscure Pain in the Side. Am. Jour. Obs., 1899, XL, 328-334.

8. Sampson: The Advantages of the Sims' Posture in Cystoscopic Examinations. Johns Hopkins Hospital Bulletin, 1903, XIV, 194-196.

9. Kelly: Operative Gynecology. D. Appleton & Co., New York, 1898, Vol. I, 285 and 405.

10. Wertheim: Ein neuer Beitrag zur Frage der Radikaloperation beim Uteruskrebs. Archiv fur Gyn., 1902, LXV, 37.

11. Krönig: Zur Tecknik der abdominellen Totalexstirpation des Carcinomatösen Uterus. Monat. für Geb. und Gyn., 1902, XV, 879-894.

12. Taussig: Ueber die post-operative Harnverhaltung und deren Folgen. Münch. Med. Wochenschrift, 1902, XLIX, H. II, 1646-1649.

13. Kolischer: Post-Operative Cystitis in Women. Am. Jour. Obs., 1903, XLVIII, 349-354.

14. Bäisch: Erfolge in der prophylaktischen Bekämpfung der postoperative Cystitis. Zeit. für Gyn., 1904, XXVIII, 380-385.

# CAESAREAN SECTION AND SERIOUS DYSTOCIA FOLLOWING VENTRO-FIXATION AND SUSPENSION.[1]

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Since the introduction of the various operative procedures by means of which it has been attempted to correct posterior displacements of the uterus by stitching it to, or suspending it from the anterior abdominal wall, reports have from time to time, appeared in the literature of abnormalities during pregnancy and dystocia at the time of labor following such operations.

Fortunately, in the vast majority of cases, the course of pregnancy and labor has been favorable, although in a small, but apparently increasing number of cases, serious disturbances have been noted. As might be expected, the degree of dystocia has varied according to the character of the operation performed. Thus, serious dystocia has so frequently followed vaginal fixation of the uterus that it has become generally agreed that the operation is not justifiable during the child-bearing period. On the other hand, there is as yet no unanimity of opinion as to the effect of ventro-fixation upon pregnancy and labor. Most authors believe that it is in general a harmless procedure and attribute the untoward results, which sometimes follow it, to errors in technique; but nevertheless, the impression has gradually gained ground that serious dystocia may occur in a certain proportion of cases, so that many gynecological surgeons have abandoned the operation and recommend that the uterus should be suspended from the anterior abdominal wall by means of newly formed ligaments, which consist merely of a fold of peritoneum. The advocates of ventro-suspension, as it is called, claim that these become stretched as pregnancy advances, and thereby allow the enlarging uterus to ascend freely into the abdominal cavity. Recent observations, however, tend to show that even this opera-

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tion is not devoid of danger from an obstetrical point of view, as in exceptional cases it appears impossible to limit the adhesions to the desired extent, and consequently fixation of the uterus may result, where only suspension was desired. For this reason, many surgeons of experience have recently abandoned it in favor of operations in which the uterus is maintained in the desired position by shortening the round ligaments in one way or the other after opening the abdomen.

It is my object in this paper to call attention to some of the serious complications which are sometimes encountered during pregnancy or labor following ventro-fixation, and occasionally even after suspension of the uterus; and particularly, to report in detail two cases of serious dystocia resulting from this cause; and finally, after studying the cases reported in the literature, to inquire whether either of the operations is justifiable from an obstetrical point of view.

CASE 1.—K. R., a colored woman, 25 years old, was admitted to the Johns Hopkins Hospital on Jan. 21, 1902, with the following history: She was always well and strong as a child, but several years ago had an attack of inflammatory rheumatism, which confined her to bed for three weeks, and left her with a shortness of breath after slight exertion. She has had three normal labors and no miscarriages. Menstruation began at the fourteenth year, occurring every four weeks and lasting eight days with considerable pain.

Eighteen months after the birth of her last child she began to menstruate at intervals of two weeks, and complained of headache, and pain in the back and lower abdomen in the intervals between the menstrual periods. Sixteen months prior to admission to the hospital, her left ovary was removed at another hospital in Baltimore, but as the operation gave no relief, her uterus was stitched to the anterior abdominal wall one month later. At the same time she was told that it would be impossible for her to become pregnant again. She, however, menstruated two or three times afterwards, and believed that her last period occurred eleven months before her admission to the Johns Hopkins Hospital. She had no idea that she was pregnant, though in August she noticed that her abdomen was growing larger. At no time did she experience any of the subjective symptoms of pregnancy, nor did she perceive fœtal movements. Three weeks before her admission to the hospital she was obliged to give up her work on account of cough, pain in the region of the abdominal scar and swelling of the feet and legs. While on her way to the hospital she slipped and fell from a street car, since when she has had sharp, intermittent abdominal pains resembling labor pains.

*Examination on Admission.*—A fairly well-developed negress, with pendulous breasts containing colustrum. Auscultation shows that the lungs are normal, but a rough systolic murmur, which is transmitted into the axilla, is heard at the apex of the heart. The abdomen is occupied by a soft tumor which extends 25 cm. above the symphysis and approaches to within 12 cm. of the zyphoid cartilage, the umbilicus being 16 cm. above the symphysis. It contracts at intervals of fifteen minutes and is identified as an 8 months pregnant uterus, with the fœtus lying obliquely with its head in the left upper quadrant. Just above the symphysis pubis there is a somewhat retracted scar 9 cm. long and 2 cm. wide, to which the uterus seems fixed by a firm band of adhesions, which extends upwards and appears to draw the fundus of the uterus downwards and forwards. The round ligaments cannot be palpated definitely.

On vaginal examination the cervix is found high up in the pelvis and displaced posteriorly, its canal is intact and the external os sufficiently patulus to admit one finger. The pelvis is generally contracted and presents the following measurements: 23, 27, 28.5, 19.75 and 10.75 cm.; the conjugata vera being estimated at 9 cm.

During the greater part of the eleven weeks which the patient spent in the hospital prior to delivery, she was confined to bed by almost constant pain in the region of the abdominal scar. This was so severe that the daily administration of sedatives and hypnotics was necessary. As pregnancy advanced the child came to lie in a transverse position, and the abdominal scar gradually became more and more retracted, its upper extremity apparently marking the lower limit of abdominal respiration. The uterus was so extremely irritable that the patient was several times thought to be in labor, and on one occasion definite painful contractions occurred at intervals of forty-eight hours and then passed away.

The patient fell into labor at 4 A. M., April 9, 1902, the pains gradually becoming more frequent and severe during the course of the day. On vaginal examination the child was found to lie in L. O. I. T. with the head not engaged, while the cervix had become markedly retracted, as compared with its condition during pregnancy, so that the external os was situated several centimeters above the sacral promontory and almost in contact with the spinal column, forming an acute angle with the anterior portion of the lower uterine segment. The cervix dilated very slowly, and after fifteen hours of hard pains its canal was still 3 cm. in length and the internal os only sufficiently dilated to admit two fingers. As the condition of the patient gradually became serious, operative interference was deemed necessary, and it was a question whether Caesarean section would be necessary for delivery.

On account of the softened condition of the cervix, Prof. Williams believed that normal dilatation could be effected and the child delivered by the vagina after version. Accordingly, the cervix was dilated by Harris' method with considerable difficulty, on account of the constrained position which the hand was obliged to assume. The membranes were then ruptured, and after version a living child, 48.5 cm. long, and weighing 3070 gms., was extracted with some difficulty. The biparietal diameter measured 9 cm. During the third stage the placenta could be distinctly felt lying in the anterior portion of the uterus, and was expressed without difficulty by Credés manœuvre.

The puerperium was afebrile, but the patient complained of great pain in the neighborhood of the scar.. This was so severe that she walked in a somewhat doubled-up position, with hesitating steps. One month after delivery, the uterus

was found to be in acute ante-position, firmly attached to the abdominal scar by short dense adhesions, and considerably larger than it should be. The cervix, however, had regained its normal position and was somewhat lacerated.

As the pain continued and was so severe as to prevent the patient from working, she returned to the hospital nine weeks after the operation, seeking relief. Accordingly, the abdomen was opened under ether anæsthesia, when a firm mass of adhesions 6 to 7 cm. long, and as broad as one's thumb, was found uniting the anterior aspect of the fundus with the abdominal scar. Imbedded in the adhesions were three silkkworm gut sutures, which passed through the recti muscles. The uterus appeared to be about twice as large as usual, while the appendages were lacking on one side and normal on the other. The cicatrix was dissected from the abdominal wall and anterior surface of the uterus, the raw surfaces of which were approximated with the catgut sutures, and the organ dropped back into the abdominal cavity. The patient made an uneventful recovery, although she still complained of some abdominal pain, which was sufficiently severe to prevent her from attending to her household duties for several months. On discharge from the hospital, and on later examination, the uterus was found in ante-position, normal in size and freely movable.

Case 2.—Mrs. M., white, aged 37. Has always been rather delicate and a mouth-breather since early childhood. She has a typical pigeon breast, which she claims is hereditary. She has had nine children and two miscarriages, the eldest child being 18 and the youngest 5 years old; all labors were normal and there was no puerperal trouble.

During the past few years she has complained of symptoms referable to the pelvic organs, for which her cervix and perineum were repaired in 1901, without, however, affording much relief. Accordingly, a competent operator suspended the uterus from the anterior abdominal wall by means of two silk ligatures on April 1, 1902, after which she made an uninterrupted convalescence. Prior to the latter operation the patient had menstruated almost continuously, but as the subsequent history will show, was pregnant at the time it was performed. Fœtal movements were perceived early in August, 1902, and at the same time she began to complain of sharp pains in the region of the bladder and abdominal scar, which increased so in severity that she took to bed in October and required large doses of morphia in order to procure sleep.

I saw the patient in consultation with Dr. W. F. Taylor, of Laurel, Maryland, Oct. 31, 1902, when she was suffering from severe abdominal pain, some fever, and excessive vomiting. At the time of the consultation the temperature was 100° and pulse 120. The abdomen was greatly distended, so that twins or hydramnios were suspected, but the uterus was so rigid that a fœtus could not be outlined. The cervix could not be detected in making a vaginal examination in the usual manner, and could be felt only after introducing the half hand, when it was found to be short and undilated, with the external os at the level of, and pointing somewhat to, the right of the promontory, and closely approximating it. Three days later I saw the patient again, when the temperature was 102°, pulse 120, and respiration 28 to the minute. These symptoms could apparently be accounted for by a severe pharyngitis and laryngitis; but in view of the probability of serious dystocia at the time of labor she was advised to come to Baltimore and enter the Church Home and Infirmary, which she did on the 3d of November, 1902.

Examination on admission showed a frail, emaciated woman in dorsal decubitis, who complained of shortness of breath while lying down, and of severe pain in the region of the abdominal scar. The limbs were so emaciated that the upper arm could easily be spanned with the fingers of one hand. The finger tips were clubbed and the nails curved and thickened, and there was some œdema about the feet and ankles. The pharynx and tonsils were red and swollen, while the chest presented the deformity already mentioned. On physical examination, expansion was equal on both sides, vocal fremitus was normal, the lungs were hyperresonant on percussion and a few crackling râles could be heard at the left apex. Forcible pulsation was apparent over the entire precordial area, but there was no thrill, the cardiac dulness extending to the right sternal margin in the fourth interspace, and the heart sounds were clear. The temperature was 100°, pulse 106, respirations 28. The entire abdomen was extremely pendulous, and the uterine tumor extended 45 cm. above the symphysis on a curved line, and to within 8 cm. of the zyphoid cartilage, while the umbilicus was 35 cm. above the former. Immediately above the symphysis was a non-retracted vertical scar, 7 cm. long and 2 cm. wide, to which the uterus was firmly adherent. The round ligaments were felt with difficulty, the right extending downward and outward from the upper angle of the scar, and the left downward and inward into the left flank. A fœtal head was felt in the left upper quadrant, but small parts could not be made out. The fœtal heart was heard in the middle line and beat 140 to the minute. The pelvis was normal. On vaginal examination no presenting part could be felt, and the cervix was in the position already described.

From the time of admission until labor set in on Nov. 9, the temperature varied between 99° and 101°, and the pulse from 100 to 120, while the patient complained of sore throat and severe pain in the abdomen and bladder, which could be relieved only by morphia, and even then she could sleep only propped up with pillows. Cover slips from the throat showed large numbers of streptococci, and the urine contained traces of albumin. The uterus remained so tense that satisfactory palpation was impossible, but the presence of a ballottable head in the left flank suggested a transverse presentation. At no time could two fœtal hearts be heard.

During the night of Nov. 8th the patient complained of severe abdominal pain, but the uterine contractions did not seem more marked than those occurring previously. The membranes ruptured spontaneously at 4 A. M., Nov. 9, and vaginal examination two hours later showed that the cervix had risen to the level of the fourth lumbar vertebra; its

canal was intact and the external os closed. In the lower uterine segment, which bulged into the pelvic cavity, pulsating vessels could be felt, which imparted a thrill suggestive of a placental bruît. Half way between the symphysis and sacrum a definite transverse ridge could be distinguished in front of which the tissues appeared more spongy, so that it was thought that the placenta was implanted low down upon the anterior uterine wall. At this time the temperature was normal and the pulse 128.

As it appeared impossible to deliver the patient per vagina, except by means of Dührssen's vaginal Caesarean section, it was thought that delivery could be effected most conservatively by means of a classical Caesarean section. The operation, however, was not begun until 9 A. M. on account of some delay in obtaining a priest, by which time the maternal pulse had arisen to 144. Upon opening the abdomen it was found that the entire portion of the uterus visible above the upper angle of the scar was derived from the posterior wall, the fundus being firmly fixed to the scar by a short band of adhesions 4 or 5 cm. thick, while the anterior bridged over the superior strait. At the same time the entire organ was displaced to the left, and so twisted upon its axis that the median end of the right round ligament was adherent to the scar in the midline. After cutting through the adhesions, the enormous uterus was delivered through the abdominal wound, when it was found to be so pendulous that its long axis formed nearly a right angle with the spinal column. The incision was through the anterior uterine wall, which was unusually thin, and two children were delivered, one having presented in the L. Ac. I. D. A., and the other in the R. O. I. P. position. Hemorrhage was readily controlled by compression of the cervix, but at the same time the uterus contracted so poorly that it was necessary to massage it constantly while the sutures were being placed. After closing the uterine incision, the raw surfaces left after severing the adhesions were covered over with peritoneum, after which the abdominal wound was closed in layers of catgut.

The patient left the operating table with a pulse of 136, which shortly afterwards fell to 120 and maintained approximately the same rate until death occurred on the sixth day. After a preliminary rise to 102.6° the temperature varied between 99.4° and 101.8°, and the respirations between 28 and 38. The bowels were readily moved on the third day. At no time was there any abdominal distension, nor any signs of intestinal obstruction or peritonitis. The patient, however, slept poorly and took but little nourishment, and failed gradually, dying five and a half days after the operation. Autopsy was refused, but on inspecting the wound it was found that it had healed *per primam,* and presented no signs of infection. One of the twins was a boy and the other a girl, and weighed 4¾ and 3½ lbs., and measured 45 and 43 cm. respectively. The former developed in a satisfactory manner, but the latter died suddenly two and a half days after birth.

Both of the cases reported in this paper present several features which appear worthy of mention. In each instance the operation resulted in fixation of the uterus, being intentional in the first and unintentional in the second. In the second case it would seem that the patient had been operated upon during the first month of pregnancy, and it is probable that the increased vascularity of the uterus incident to the condition played a prominent part in the production of the abnormal adhesions. In each of my own cases the fixation was in the neighborhood of the fundus, but in neither of them was the pelvic inlet obstructed by a mass of uterine muscle, as is frequently observed, since in both the anterior wall of the uterus was normal in thickness. Both patients complained of almost constant pain, and were bedridden for several months before labor; and at the same time their uteri were so irritable that it was impossible to say at any given time whether labor was imminent or not. In each case the abnormal position of the cervix was noted during pregnancy and became accentuated during labor.

### Complications of Pregnancy from Ventro-fixation.

The complications of pregnancy which may be ascribed to ventro-fixation vary greatly in degree, and doubtless depend upon the extent and length of the adhesions which fasten the uterus to the abdominal wall. Fortunately, in many cases, even though the adhesions be firm and dense, little or no difficulty is experienced, while in others, adhesions of the same character may give rise to serious complications, which have been tabulated by Kelly as follows:

1. Marked retraction of the scar due to the tugging of the adherent uterus.
2. Constant hypogastric pain.
3. Retraction and displacement of the cervix, even up into the abdominal cavity.
4. Formation of a tumor obstructing the pelvic inlet, resulting from hypertrophy and deficient expansion of the anterior uterine wall.
5. Excessive thinning of the posterior wall of the uterus.
6. Abortion or premature labor.
7. Persistent and excessive nausea.

During labor the following complications may be noted:

1. Prolongation of pregnancy.
2. Inertia of the uterus due to excessive thinning of its walls.
3. Dystocia due to the tumor formed by the contracted anterior wall of the uterus.
4. Inability of the cervix to dilate, owing to its abnormal position.
5. Increased frequency of abnormal presentations.
6. Rupture of the scar of fixation.
7. Rupture of the uterus.

Noble, in 1896, collected from the American literature 56 cases of pregnancy following 808 operations for ventro-fixation or suspension of the uterus, in which at least one ovary remained. At the time of his report 6 patients had aborted and 43 had gone on to term, with 3 deaths; one patient having died from heart disease before labor, the second from infection occurring before delivery, and the third from infection following a Porro-Caesarean section. As the first two deaths

could hardly be attributed to the operation, he figured out a mortality of a little over 2 per cent, although it would appear that one of the other patients, who was undelivered at the time of the report, died subsequently.

Later, in the same year, Dorland tabulated 179 cases of pregnancy following these operations, and adduced a number of interesting observations; thus, in only 38 per cent of the cases did both pregnancy and labor pursue an uncomplicated course, although pregnancy was normal in 67 per cent and labor in 62 per cent of the cases, with 9½ per cent remaining undelivered. After deducting the latter, and the 14 per cent of cases which ended in abortion or premature labor, there remained for consideration 137 cases which presented the following abnormalities:

| | | |
|---|---|---|
| Retraction of the cervix to the level of the promontory or higher | 10 cases | (7 per cent) |
| Threatened rupture of the uterus | 9 " | (6.5 per cent) |
| Abnormal presentations (6 transverse) | 9 " | (6.5 per cent) |
| Serious dystocia | 23 " | (17 per cent) |
| Post-partum hemorrhage | 3 " | (2.2 per cent) |
| Retained placenta | 3 " | (2.2 per cent) |

The cases presenting serious dystocia were delivered by forceps in 11 instances and by version in 9; while Caesarean section became necessary in one case—8 per cent, 6.5 per cent and 2 per cent respectively; while the fœtal mortality was 18 per cent and the maternal 1.5 per cent, leaving out of consideration the deaths which were not directly due to the operation.

In addition to the case reported in this paper, I have collected 20 others from the literature, in which Caesarean section was necessary, and in all but one of them the data were more or less complete. Thus, in the 20 cases of which the number of antecedent labors was mentioned, we find that 4 patients had 1, four 2, three 3, two 4, and the others 5, 7 and 9 children, respectively, while four were pregnant for the first time. In 12 cases the time was given at which the membranes ruptured. This occurred at or before the onset of labor in 9 cases, after four and a half and fourteen hours respectively in two other cases, while one patient was delivered by Caesarean section before the membranes ruptured. In 17 cases the time was given which elapsed between the onset of labor and the Caesarean section, 2 cases going four hours, 4 eight to twelve hours, 4 twenty to twenty-four hours, 2 two days, 2 four days, and 1 five days, while another case was operated upon two weeks after rupture of the membranes, twenty-four hours after the onset of hard labor; while in the seventeenth case the operation was performed before the onset of labor, and after futile attempts to induce it by manual dilatation of the cervix and the use of the rubber bag. Moreover, it is interesting to note that in 7 cases some manipulation other than external version was attempted before resorting to Caesarean section.

In each of the 19 cases in which the position of the cervix was mentioned, it was situated above the promontory of the sacrum, and in 2 cases at so high a level that it could not be reached by the fingers. Among the other data the following facts may be mentioned: The pelvis was normal or only slightly contracted in every case but one, twins were noted twice, transverse presentations in 15, vertex in 3, and breech in 2 cases; while in 3 others the position was not given. Eight mothers died (38+ per cent), while in the 18 cases in which the result to the fœtus was noted, there were 8 deaths, a mortality of 44½ per cent. The conservative Caesarean section was performed in 14, and the Porro operation in 6 cases, with four deaths following the former and three the latter operation; while no particulars were given concerning the remaining fatal case.

While searching the literature for reports of cases of Caesarean section following ventro-fixation and suspension, I have met with the records of many other cases, in which the dystocia was attributable to abnormal fixation of the uterus, and which required delivery by forceps or version; but I have made no attempt to collect them, or the cases of death from rupture of the uterus, in which delivery was not effected; and would refer the reader, who may be interested in this accident, to the reports of Dickinson, Mackenrodt, von Guérard, Noble, Broadhead and Morrill. I might also mention that instead of attempting Caesarean section, laparotomy was performed in at least two other cases and the adhesions freed, after which delivery was effected in one case through the natural passages.

Admitting that the cases of Caesarean section referred to constitute but a small proportion of the total number of pregnancies occurring after ventro-fixation, the results following the operation are, nevertheless, so serious as to warrant careful consideration, and to lead one to inquire how they may be improved or prevented.

In the majority of cases the fixation was intentional, as the uterus had been sutured directly to the abdominal wall; though it is probable that in certain of them other operative procedures, carried out at the same time, contributed to the formation of denser and firmer scars than was originally intended. On the other hand the advocates of ventro-suspension have claimed that the adhesions created by that operation are never firm or resistant enough to complicate pregnancy or labor, and it must be admitted that in the hands of competent operators this is almost universally the case. Yet, at the same time, it occasionally happens that from one cause or another, the area of adhesions may be increased, and the intended suspension may be converted into a fixation. Such a result may be attributed to lack of operative skill and faulty technique, suppuration of the abdominal wound, intensification of the adhesions from other operative procedures, or the increased vascularity of a pregnant or puerperal uterus. That the latter condition may occasionally be the cause of fixation is apparent from the consideration of my second case, and one other which I recently observed in the lying-in ward of the Johns Hopkins Hospital. In both instances ventro-suspension had been performed when the operator was unaware of the existence of pregnancy, the operation being complicated by the removal of a dermoid cyst and the stitching in place of a floating right kidney in the latter case. Fortunately, dystocia did not occur, although definite fixation resulted.

## TABLE OF CASES.

| Reported by. | Age. | Previous full term Pregnancies | Time Elapsed since Operation before Delivery. | Operation Previously Performed. | Pelvis. | Presentation. | Duration of Labor before Section. | Time of Rupture of Membranes. | Position of Cervix. | Previous Manipulation. | Cæsarean Section. | Maternal Result. | Fœtal Result. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Abel | 35 | 1 | 3 years. | Ventro-fixation. | ? | Vertex. | 41 hours. | Onset of labor. | High and posterior. | Vaginal examinations. | Porro. | Recovery. | *Dead born.* |
| Batchelor | 22 | 1 | 1 year. | Ventro-fixation. | Normal. | Transverse. | 12 hours. | Onset of labor. | High above promontory. | Many vaginal examinations. | Conservative. | *Death.* | *Dead born.* |
| Bidone | 22 | 2. One after Cæsarean case of Pinzani. | 3 years. | Ventro-fixation. | Normal. | Transverse. | ? | Patient did not remain in hospital, but left against advice and was delivered outside by "Cæsarean section." | | | | *Death.* | *Death.* |
| Bidone | ? | 2 | 3 years. | Ventro-fixation and ovariotomy. | ? | Transverse. | 9½ hours. | After 4½ hrs. of labor. | 2 cm. above promontory. | Vaginal examinations. | Conservative. | Recovery. | Living. |
| Bloomhardt | 43 | 4 | 6 years. | Ventro-fixation. | ? | Transverse. | 4 days. | Onset of labor. | Above promontory and posterior. | Attempt to bring cervix into pelvic axis. | Porro. | *Death.* | *Death.* |
| Brown | 37 | 0 | 1½ yrs. | "Some form of ventro-suspension." | Normal. | Transverse. | 4 hours. | Onset of labor. | Not felt. | Vaginal examination only. | Conservative. | Recovery after temperature of 104° on 6th day. | Living. |
| Cragin | 27 | 0 | 4 years. | Ventro-fixation. | ? | Transverse. | One day. | Early in labor. | High up and posterior. | Vaginal examination only. | Conservative. | Recovery. | Living. |
| Dickinson | 34 | 0 | 4 years. | Ovariotomy and ventro-suspension. | Normal. | Twins in breech and vertex. | Not in labor. | Not ruptured. | Ext. os at first lumbar vertebra internal os not reached through cervical canal 10 cm. in length. | Attempt to dilate cervix and induce labor with rubber bag. | Conservative. | *Death.* | Living. |
| Edebohls | 27 | 4 | 2 years. | Ventro-fixation after unsuccessful attempt at Alexanders operation in which left round ligament was ruptured. | ? | Transverse. | ? | ? | High and posterior. | ? Rupture of Uterus. | Porro. | *Death.* | *Death.* |
| Goubaroff | 23 | 0 | 4 years. | Ventro-fixation. | Normal. | Transverse. | Four days. | ? | High and posterior. | Laparotomy to release adhesions. Hæmorrhage necessitated Cæsarean. | Conservative. | Recovery. | Living. |
| Ill | 29 | 2 | 2 years. | Ventro-fixation and perineal plastics. | ? | ? | 2 weeks (?) 24 hours of hard labor. | At onset of pains. | Above promontory. | Vaginal examination only. | Conservative. | Recovery. | *Death on first day.* |
| Ill | 25 | 3 | 5 years. | Ventro-fixation and perineal plastics. | ? | ? | 5 days. | ? | Not felt. | Vaginal examination only. | Porro. | Recovery. | *Dead born.* |
| Ill | 42 | ? | 1½ yrs. | Ventro-fixation and perineal plastics. | ? | Transverse. | 2 days. | ? | "High in pelvis." | Vaginal examination only. | Conservative. | Recovery. | Living. |
| Lynch | 37 | 9 | 8 mos. | Ventro-suspension during pregnancy. | Normal. | Twins in vertex and transverse. | 4 hours. | Onset of labor. | High above promontory. | One vaginal examination. | Conservative. | *Death.* | One living. *One death on 3rd. day.* |
| Müller | 32 | 3 | 2 years. | Ventro-fixation and perineal plastics. | ? | ? | ? | ? | ? | ? | ? | *Death.* | ? |
| Noble | 37 | 5 | 1 year. | Ventro-fixation and salpingo-oophorectomy. | ? | Breech. | 24 hours. | Onset of labor. | Level of promontory and posterior. | Attempt to dilate cervix and bring down foot. | Porro. | *Death.* | Not given. |
| Pinzani | 20 | 1 | 1 year. | Ventro-fixation and salpingo-oophorectomy. | Normal. | Transverse. | 20 hours. | After 14 hours of labor. | Level of promontory and posterior. | Attempt at internal version. | Conservative. | Recovery. | Living. |
| Pozzi | ? | 3 | 1 year. | Ventro-fixation. oophorectomy. | ? | Transverse. | ? | Onset of labor. | Dislocated posteriorly. | ? | Conservative. | Recovery. | Living. |
| Rapin | 21 | 1 forceps. 1 premature induced labor. | 1 year. | Ventro-fixation. | Contracted conjugata vera 9 cm. | Transverse. | 12 hours. | ? | Very high posterior. | Vaginal examination only. | Conservative. | Recovery. | Living. |
| Schütte | 35 | 7 | 5 years. | Ventro-fixation and salpingo-oophorectomy. | Normal. | Transverse. | 8 hours. | ? | Very high. | — | Conservative. | Recovery. | Living. |
| Werder | 24 | 1 | 4 years. | Ventro-fixation and perineal plastics. | ? | Transverse. | 1 day. | ? | Level of promontory. | Attempt to bring cervix into pelvic axis. | Porro. | Recovery. | ? |

The vascularity of the puerperal uterus may act in a similar manner, as was illustrated by another case coming under my observation, in which it was attempted to suspend the uterus seven weeeks after labor. At the operation the sutures repeatedly cut through the friable uterine tissue, so that considerable manipulation was necessary. As a consequence, when the patient recovered, the uterus was found to be firmly adherent to the anterior abdominal wall, instead of merely suspended from it. That neither of these favoring circumstances are absolutely necessary to the formation of dense adhesions, was shown by another case in which the uterus, although suspended by a competent operator, in the absence of any abnormality save displacement, became firmly fixed to the abdominal wall. This patient entered the lying-in ward when eight months pregnant, and presented dense adhesions between the uterus and abdominal wall, which were readily palpated. They stretched but little during pregnancy, and prevented the uterus from rising in the normal manner. Fortunately, the roomy pelvis compensated for this, and dystocia did not occur; though at the time of labor the cervix appeared at the vulva, where its dilatation could be followed with the eye.

The cause of dystocia in all these cases can be readily understood upon considering the anatomical conditions resulting from the operation. Thus, if the fundus be firmly attached just above the symphysis by dense adhesions, the anterior uterine wall will be unable to expand, and consequently the increase in size of the organ must be effected altogether at the expense of its posterior wall. As the ascent of the fundus is thus impeded, the foetus tends to accommodate itself in an oblique or a transverse position, and by its further growth causes the posterior wall to become so thin as to approach the verge of rupture. At the same time the tension exerted by it tends to draw the cervix upward from its normal position, until it comes to lie in the neighborhood of the sacral promontory. Moreover, in a certain number of cases the thickened anterior uterine wall may form a tumor which obstructs the superior strait, and it would appear probable that such a condition is more apt to occur when the fixation is by means of the posterior wall of the uterus, since it was absent in the two cases here reported, in which fixation was by the anterior wall.

In such cases, in the latter months of pregnancy, dense adhesions can be palpated extending from the abdominal cicatrix to the body of the uterus, and as pregnancy advances the scar may become retracted. At the same time, when the round ligaments are palpable, their upper extremities will be found in the neighborhood of the upper end of the scar, thus showing that the fundus is in the neighborhood of the symphysis, instead of at the vertex of the uterine tumor.

At the time of labor, dilatation of the cervix is effected very imperfectly, if at all; since the bag of waters and the presenting part, instead of impinging directly upon the internal os, exert their force upon the portion of the uterus anterior to it, and consequently, no matter how strong the contractions may be, labor comes to a standstill, and unless suitable operative interference is undertaken, rupture of the uterus must become imminent.

### TREATMENT.

Considerable discussion has arisen as to the most suitable means of treating this class of complications when observed in pregnancy, and the following methods have been advocated:

(a) Induction of premature labor;

(b) Freeing the adhesions after laparotomy;

(c) Allowing the patient to go to term, and should dystocia occur, to attempt delivery by forceps or version, after manual or instrumental dilatation of the cervix, or if necessary, to perform the classical Caesarean section or Dührssen's vaginal operation.

It seems to me that the field for the induction of premature labor is extremely limited for three reasons: In the first place, it does away with the possibility of spontaneous labor at term; and secondly, it is associated with a tremendous foetal mortality. Moreover, the operation may prove extremely difficult in the cases in which it may be indicated, and in some instances prove impossible of accomplishment.

The performance of laparotomy followed by the freeing of adhesions is indicated only in the exceptional cases in which the patient is seen early in pregnancy, and complains of intense abdominal pain. On the other hand, when the patient is only seen before labor, the procedure is contraindicated for several reasons: In the first place, a large wounded area will be left on the uterus, which must be covered over by peritoneum, and thereby greatly increase the chance of premature termination of pregnancy. Moreover, in the second place there is considerable doubt as to the advisability of allowing a uterus, which has recently been subjected to so severe a procedure, to stand the strain of labor; not to speak of the fact that the freshly formed abdominal cicatrix may be severely damaged.

As far as I can ascertain, Goubaroff and Bidone attempted such a procedure after the onset of labor, in the hope that spontaneous delivery would follow; but their results were not sufficiently encouraging to tempt one to imitate them, for, in the former's case, the hemorrhage was so severe that Caesarean section became necessary to prevent the woman from bleeding to death; while in the latter's the procedure was not followed by the desired result, and it later became necessary to dilate the cervix manually, after which version was performed and extraction attempted. As this could not be accomplished, craniotomy was resorted to, and even then the child was delivered only after the greatest difficulty, and the mother developed a peritonitis which nearly cost her life.

Dührssen's vaginal Caesarean section, or the modification proposed by Hübl, has been practiced in a number of cases of dystocia following vagino-fixation of the uterus, in which manual dilatation of the cervix was out of the question. It would appear, however, that in the class of cases under con-

sideration, the danger of hemorrhage is considerable after this operation, and may be so profuse as to make it necessary to sacrifice the uterus in order to prevent death. And, moreover, the adhesions which gave rise to the condition cannot always be readily separated through the vagina, and therefore should the woman recover, she may be exposed to a similar danger in a subsequent pregnancy.

In view of the various considerations just advanced, it would seem to me a better practice to allow the patient to go on to term, unless the pain in the region of the abdominal cicatrix be so severe as to demand relief during pregnancy. If, at the time of labor, the fixation is dense and the cervix displaced above the level of the sacral promontory, I believe that the best results will be obtained by resorting to Caesarean section at the onset of labor, and without any attempt at delivery through the natural passages. In such cases, after releasing the adhesions the operation is readily performed, and should give satisfactory results, provided it is done by a competent operator under suitable surroundings.

Up to the present time, however, the mortality following such operations has been extremely high, and would seem to be due to infection contracted during intra-uterine manipulations which had previously been undertaken; though, in the few cases in which the operation has thus far been performed primarily, the condition of the patient was so serious as to make its outcome very doubtful. Whether the results of Caesarean section, for this variety of dystocia, will ever be as favorable as those performed for pelvic contractions, remains to be seen; but there is no reason why they should be anything like so serious in the future as they have been in the past.

In conclusion, I think it should be inquired whether operations likely to result in fixation of the uterus to the anterior abdominal wall are ever justifiable during the childbearing period. The untoward results following ventro-fixation clearly indicate that the operation should be abandoned; while the few cases in which unintentional fixation has followed supposed suspension of the uterus, render it questionable whether even this more conservative operation should be employed. For my part, I am inclined to take the ground that neither procedure is justifiable until after the menopause, as it does not seem proper to undertake an operation for the cure of a condition which does not threaten the life of the patient and merely exposes her to a certain amount of discomfort, when we know that it may give rise to most serious dystocia should she become pregnant.

Which will prove the most suitable operation for the cure of displacements of the uterus during the childbearing period cannot as yet be definitely predicted, though it seems to me that some of the procedures which aim to maintain the organ in position by shortening the round and the utero-sacral ligaments, will eventually prove to be the operation of choice. It is possible that Alexander's operation may prove the ideal procedure when the uterus is movable; but when it is adherent the abdomen must be opened, in order to free it, and under such circumstances some intra-abdominal method of shortening the ligaments would appear most rational.

### LITERATURE.


ABEL: Eine neue indication zur Sectio Caesarea nach Porro. Berliner Klinisch. Wochensc. 1896, No. 13, S. 280.

BATCHELOR: Caesarean Section for Dystocia Following Hysteropexy. Australasian Medical Gazette. 1899, 18, Octo. 28th.

BIDONE: Distocie gravi da isteropessi. Atti della Società Italiana di ostetricia e ginecologia. 1896, 3, p. 258.

BLOOMHARDT:[1] Dystocia following ventro-fixation. American Medicine, January 11, 1902, p. 73.

BRODHEAD: Remarks in Discussion of Paper by Dickinson. q. v. American Journal of Obstetrics, 1901, Vol. 44, p. 253.

BROWN: Caesarean Section Necessitated by Ventro-suspension. American Journal of Obstetrics, 1902, August, p. 197.

CRAGIN: Caesarean Sections. Medical Record, 1901, Vol. 59, p. 695.

DICKINSON: Pregnancy Following Ventral-fixations, One Ending in Rupture of the Uterus, and One in Caesarean Section. American Journal of Obstetrics, 1901, July, p. 34.

DORLAND: Gestational Complications and Dystocia Subsequent to Anterior Fixation of the Uterus. University Medical Magazine, 1896, December, p. 163.

EDEBOHLS: Shortening the Round Ligaments: Indications, Technics, and Results. American Gynecological and Obstetrical Journal, December, 1896, p. 725.

GOUBAROFF: Dystocie due à une Hystéropèxie necessité l'operation Cesarienne. La Semaine Médicale, 1895, p. 245. Also Medical Week, Paris, 1895, Vol. III, p. 305.

VON GUERARD: Köliotomie bei Geburtsstorüng nach ventrifixur. Centralb. für Gynaek., 1896, 20, p. 531

ILL: Ten cases of Caesarean Sections. American Journal of Obstetrics, 1901, November, p. 648.

KELLY: Operative Gynecology, 1902, Vol. ii, p. 157.

MILANDER: Ventrifixation des Uterus; Schwanger-schaft und Querlage des Kindes. Zeitschrift für Geburtsh. u. Gynaek., 1895, XXXIII, S. 464.

MÜLLER: Beitrag zur Operationen Behandlung der Retroversio-flexio uteri. Inagg. Dissertation, Würzburg, 1896.

NEGRI: L'isteropessi studiata dal punto di vista ostetrico. Annali di Ostetr. e ginec., 1896, 18, p. 460.

NOBLE: Suspensio Uteri with Reference to its Influence upon Pregnancy and Labor. American Journal of Obstetrics, 1896, Vol. 34, p. 160.

PINZANI: Quattro casi importani di laparatomia a scopo ostetrico. Atti della Società Italiana di ostetr. e ginec., 1894, Vol. I, p. 37.


[1] The same case apparently has also been reported by Findley. Journal Amer. Med. Ass'n, Aug. 23, 1902.

POLTOVICZ: Remarques sur quelques cas d'hysteropexie d'apres les observations recueillies à la clinique chirurgicale de Lausanne. Revue Médicale de la Suisse Romande, 1895, p. 21.

POZZI: Contributo alla casistica delle distocie da ventrofissazione dell' utero. Giornale della R. Accademia di Medicina di Torino, 1900, Vol. 6, p. 603.

RAPIN: Multipare. Bassin rachitique. Operation Cesarienne. Revue Médicale de la Suisse Romande, 1895, p. 213.

SCHÜTTE: Ueber Geburts-complicationen nach ventro-fixatio uteri. Monatsschr. für Geburtsh. u. Gyn., 1899, No. 10, S. 489.

STRASSMAN: Zur Kenntniss des Schwangerschaft und Geburts-verlaufes bei antefixirtem uterus. Archiv. f. Gynaek., 1896, No. 50, p. 473.

WERDER: Two Cases of Dystocia Following Ventrafixation, One Requiring Caesarean Section. American Journal Obstetrics, November, 1899, p. 615.

# TWO CASES OF MULTIPLE SACCULAR ANEURYSMS OF THE AORTA WITH RUPTURE INTO THE PERICARDIUM.

BY P. K. GILMAN.

*(Notes from the Pathological Laboratory of the Johns Hopkins Hospital.)*

The following cases of multiple saccular aneurysm formation in the arch of the aorta with rupture into the pericardium have some anatomical interest, and are reported through the courtesy of Dr. W. G. MacCallum.

CASE I.—C. S., a colored coachman aged 39, was admitted to the hospital several times during the years 1901-1903 with signs of aneurysm formation in the region of the arch of the aorta. There was great variation from time to time in the physical signs, the prominence caused by the aneurysm and the area of maximum pulsation being somewhat movable. During the last admission and up to the time of the patient's death there was present a well-developed tracheal tug and a leathery friction rub was heard in the left upper chest.

At autopsy a large irregular sac was found in the pericardial region densely adherent to the left lung, which in turn was compressed and bound firmly to the thoracic wall.

The pericardium was distended with blood which, in addition to being firmly clotted, was shown to be partly organized, the organization being more advanced at the apex than elsewhere. The clot was thickest over the base of the heart posteriorly and thinnest about the apex. The heart itself was generally hypertrophied, though its valves were delicate.

From the arch of the aorta there arose three aneurysmal sacs, the largest, 12 cm. in diameter, involving the anterior face of the vessel from 4 cm. above the valves to the origin of the innominate artery, the second, 6 cm. in diameter, involving the convex portion of the arch and giving off the innominate, left carotid, and subclavian arteries, the third, 2.5 cm. in diameter, springing up from the descending aorta about 2 cm. below the second.

The largest of these sacs extended downward and to the left, compressing the right auricle downward and backward. It was lined in its lower portion by a firm laminated clot 2 cm. thick. In its lower right portion was an irregular ragged slit which communicated with the pericardium, and through which the hæmorrhage had occurred.

The second aneurysm had compressed the left bronchus and had given rise to a generalized bronchiectasis in that lung, which, in addition, had undergone a very extensive tuberculous consolidation. The right bronchus had suffered no compression, and the lung was voluminous with widely dilated air cells.

This case, aside from the anatomical peculiarities, is chiefly interesting from the fact that the extensive hæmorrhage into the pericardium had been survived long enough to permit partial organization of the clot.

CASE II.—E. L. W., a negro aged 43, who died with signs of aortic aneurysm and pulmonary tuberculosis. At autopsy there was found disseminated tuberculosis of both lungs with extensive caseation of the bronchial and peritracheal lymph glands.

The pericardium was much thickened and hæmorrhagic, and was covered with ragged fibrous adhesions. Its cavity was distended with a laminated clot, showing some organization where it adhered to the pericardial surfaces. But for a general hypertrophy the heart was not greatly altered, though the aorta was enormously dilated from a point 3 cm. from its origin, the dilatation measuring 9 cm. in diameter. This was rather an aneurysmal dilatation than a saccular aneurysm. The walls of the dilatation were roughened by irregular patches of sclerotic thickening of an extreme grade, though there was no calcification. There were several irregular saccular bulgings of the walls, reaching sometimes 2 cm. in diameter, and filled with thrombus masses. At the upper part of the ascending portion of the aorta one of these sacs had ruptured, and the opening, about 2 cm. in diameter, bore a lobulated corrugated thrombus mass. A probe passed through this opening entered a cavity hollowed out in one of the large caseous bronchial glands and thence passed into the pericardium, showing the path of the hæmorrhage into the pericardium.

Sections of the pericardium showed a well-developed tuberculous pericarditis, and it seems probable that the path ultimately followed by the stream of blood may have been the original path followed by the tubercle bacilli in their spread from the lymph glands to the pericardium.

# REPORT OF RESULTS OF NURSING DISPENSARY TUBERCULAR PATIENTS.

BY R. THÉLIN,

*Visiting Nurse for Tuberculosis.*

The results of three months' visiting of tuberculous patients from the Johns Hopkins Hospital Dispensary are, on the whole, encouraging. The work is as yet retarded by the need of a room where a separate clinic can be held, but this want is soon to be filled, we hope, through the generous donation of Mr. Henry Phipps.

Under the present arrangement, the nurse is not able to be present at the clinic, but is given the names of the patients by the doctors in the dispensary. She also accepts names from the Federated Charities, and, if possible, brings those patients to the dispensary for a definite diagnosis.

The majority of the dispensary cases are from the laboring classes, many of them intelligent working men, who have spent their all on doctors or on quack medicines. They say that when they had money to pay a doctor, they did not think it right to go to a free dispensary. Now, their money gone, they come to the dispensary, too late, in many cases, to be saved! In many instances they receive the new ideas with favor and after trying the experiment of sleeping with an open window, generally feel so much better that they are more than willing to continue it. Out of sixty-five cases seen, thirty-eight have been willing to sleep with their windows open, and are continuing it more or less faithfully.

In the winter months it has been more difficult to get tubercular patients out in the day-time, either from weakness and lack of energy on their part, or from lack of proper clothing when they had the energy. Nor has the plan of sitting with open windows, well wrapped up, been very successful as yet.

The doctors urge the patients to go to the country, if possible, and in nine instances they obeyed so promptly that they were gone before the nurse could get to see them. As the Hospital for Consumptives at Towson can accommodate only twenty-five patients we usually find out whether the patients can make arrangements to go to friends in the country before considering Towson as a possibility. We have sent four white patients there, and three colored patients to the Hospital for Tuberculosis at Bay View.

As regards diet, the help afforded by the Federated Charities is immeasurable. Thirteen patients only are able at present to supply themselves with the necessary quart or more of milk daily, but twenty-eight are daily supplied with one quart of good milk and two fresh eggs by the Federated Charities. They have also supplied a cot for a colored boy who was sleeping with his mother and sister. In another case of this sort, the boy was sent to Bay View.

The precautions to prevent the spread of infection are generally taken up by the family with great care. Sometimes a feeling of disgust and fear of the poor patient has developed on the part of friends and neighbors which has added to his already too heavy burden. Strange as it may seem, there is also a certain class of tubercular patients who, becoming embittered by their hard fate, refuse to be considered as sources of infection to others and strenuously oppose the efforts of their families to protect others from the disease. The existence of this class points to the necessity of such stringent laws as are now being enforced in New York.

Our health authorities have not done much in the matter of legislation against tuberculosis as yet. Even fumigation is not compulsory; the request to have a tuberculous house fumigated must be accompanied by a signed order from the owner or tenant. Notwithstanding our discouragements there is ground for hope in the fact that the work of visitation has been begun, and that four patients are undoubtedly gaining in weight and strength as a result of it. Two of these, who were too weak to walk one block, are now able to attend to their ordinary housework. One recently walked two miles, and hopes soon to be strong enough to go to work.

REPORT OF WORK FOR THREE MONTHS.

| | |
|---|---|
| Total number of visits for December | 72 |
| " " " " " January | 86 |
| " " " " " February | 87 |
| Total for three months | 245 |
| Dispensary Patients | 42 |
| Patients from Federated Charities or interested persons | 25 |
| Not seen because of wrong address | 11 |
| " " " gone to the country | 9 |
| " " " sent to hospital | 3 |

**THE JOHNS HOPKINS HOSPITAL BULLETIN.**

The Hospital Bulletin contains details of hospital and dispensary practice, abstracts of papers read, and other proceedings of the Medical Society of the Hospital, reports of lectures, and other matters of general interest in connection with the work of the Hospital. It is issued monthly.

Volume XIV is now completed. The subscription price is $2.00 per year. The set of fourteen volumes will be sold for $50.00.

# PROCEEDINGS OF SOCIETIES.

## THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

*December 7, 1903.*

The meeting was called to order by the President, Dr. Futcher.

**Perineal Zoster.** DR. CUSHING.

An herpetic eruption rarely occurs over the sacral areas. According to Head's tabulation of 378 cases, in seven instances only did the eruption have a sacral distribution, the lowest segment of which mention is made in his paper being the third sacral.

FIG. 1.

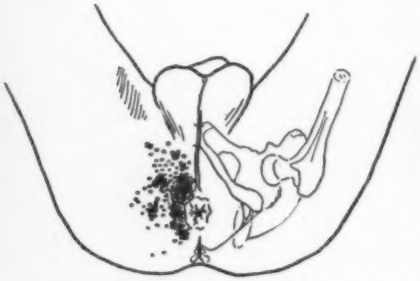


FIG. 2.

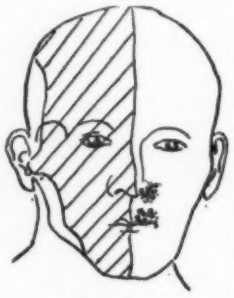
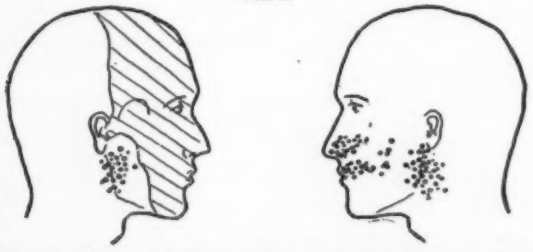


FIG. 1.—Outline sketch of area of vesiculation over perineum in Case I.
FIG. 2.—Diagram showing postoperative area of anæsthesia in Case I, with an outcrop of herpes facialis on the opposite side.

FIG. 3.



CASE II.—Distribution of facial and bilateral cervical herpes. Note that the postoperative anæsthetic area remains free, indicating that the eruptions presumably originated from lesions in the posterior root ganglia (cervical and trigeminal).

Twice, in the writer's series of cases of trigeminal neurectomy, has the operation been followed by an outcrop of herpes. In the first case the distribution of the vesicles on the perineum was taken to represent a lesion of the fourth sacral posterior root ganglion (cf. Fig. 1). There was an accompanying vesiculation of the herpes febrilis type on the non-anæsthetic side of the face (Fig. 2). In the second case sensory symptoms, such as are the frequent precursors of herpes zoster, appeared after the operation, having a bilateral perineal distribution similar to that in the first case. The symptoms were interpreted as indicating a lesion of the posterior root ganglia (S. iv.), which did not suffice to cause vesiculation; "herpes zoster" without eruption, as described by James Mackenzie. This perineal disturbance was accompanied, as in the first case, by a quite extensive facial herpes which again failed to encroach upon the skin-field rendered anæsthetic by the ganglion extirpation (Fig. 3).

The pathology of herpes facialis seu febrilis has been the occasion of dispute. Many have thought the lesion to be quite distinct from that which produces true herpes zoster. Howard, however, has found lesions in the Gasserian ganglion in a case of common facial herpes accompanying pneumonia. This observation together with those above cited, that after Gasserian ganglion extirpation an herpetic eruption does not occur over the resultant anæsthetic field, suffices to render it most probable that posterior-root ganglion lesions are responsible for the common forms of herpes about the lips and nose as well as for zoster.

The perineal eruption in the first case and the hyperæsthetic area in case two with a similar distribution, allow of certain generalizations as to the cutaneous skin-fields of the lower sacral segments. In the ordinary diagrams with the subject in the erect posture the lower (fourth and fifth) sacral fields are completely hidden. It is necessary to put the body and lower extremities in the embryonal position in order to understand clearly the configuration of the skin-fields below the second sacral, this being the lowest to enter completely into a leg distribution. The coccygeal, fifth, fourth and third sacral areas surround the caudal end of the body in concentric fashion, the strips running from mid-dorsum to mid-venter just as do the thoracic and abdominal skin-fields, and like these retain in large measure their simple, primative and undistorted arrangement.

**Notes on Hydatid Disease in Australia.** DR. J. RAMSAY, of Launceston, Tasmania.

Dr. Ramsay gave an account of hydatid disease in Australia, where it occurs more commonly than in any other country in the world except Iceland. Dogs, rabbits, kangaroos and oxen are affected. The chief source of infection in man is from the feces of dogs. The successful treatment is surgical and consists in a removal of the hydatid cysts.

### DISCUSSION.

DR. CUSHING.—I was very much interested in what Dr. Ramsay said about the rarity of hydatid in the spine. One of the very few cases of hydatid I have seen operated upon was one in which multiple cysts in the spinal canal had been the cause of a pressure palsy. The case was operated upon by Sir Victor Horsley a few years ago in London.

DR. MCCRAE.—We are indebted to Dr. Ramsay for this excellent paper. Hydatids are of course rare in this locality, but it is well to be on the lookout for them. It is interesting to see how exploratory puncture has fallen into disfavor for the diagnosis of hydatids. Twenty-five years ago puncture was done in appendix conditions, ten years ago for distended gall

bladder, and I suppose ten years hence many of the punctures done now will have been abandoned.

DR. FUTCHER.—Hydatid disease is undoubtedly rare in this country. Dr. Lyons' statistics were referred to by Dr. Ramsay. He found that up to 1902 there had been 241 cases reported in this country, only one of which was known to be a native-born American. In 136 the patients were foreigners. In 92 the nativity of the patients was not known. Ten were negroes and two were Canadians.

It is interesting to note that there were 56 cases in the Province of Manitoba, Canada. The explanation for this is that there is a large settlement of Icelanders in that province, and hydatid disease is very common in this race. Only one instance is known in a Canadian-born offspring of an Icelandic emigrant.

DR. RAMSAY.—Our statistics of hydatid of the kidney are a little different from those usually compiled. Neisser found 8 per cent, I believe, but with this exception it is said to have been rare. You are to be congratulated upon knowing nothing about hydatid in this country. I advise you to keep the disease out of the country.

**Intra-pelvic Hematoma following Labor.** DR. WILLIAMS.

I wish to report a case which I saw in consultation about a month ago with Dr. H. L. Smith, which was of great interest to me, both on account of its rarity and the favorable result following operation.

I saw the patient on the evening of November 2, 1903, and obtained the following history:

Thirty-three years old, married three years, and had been delivered a few hours previously of her first child, which weighed a little less than six pounds. The labor was quite slow and was terminated by an easy low forceps operation without anæsthesia. The statements concerning the delivery were made by the nurse, as Dr. Smith did not deliver the patient himself, being called in some hours later in the absence of the regular medical attendant. The placenta was expelled shortly after the birth of the child and everything seemed to be most satisfactory. There was no hemorrhage. Almost immediately after delivery the patient began to complain of intense pain of a tearing character about the rectum, which was so severe as to require the administration of a hypodermic of morphia. The patient stated that this pain was more intense than any she had felt during labor. Her general condition was good, as was evidenced by the fact that her physician, who lived in the country, left her at the end of an hour, saying he would see her the next day.

After his departure, the pain became much more severe and the patient gradually passed into a condition of collapse. Three hours after delivery she was seen by a neighboring physician, and later by Dr. Smith. At that time she was greatly shocked, pulse 160-70, and complained of intense pain. After the subcutaneous injection of normal saline solution and the administration of strychnia and whiskey, her condition improved somewhat, but soon changed for the worse, when a diagnosis of internal hemorrhage was made, and I was asked to see her.

The patient was a large, well-nourished woman, with a very pallid face and a rapid thready pulse of 160. On palpation, the lower abdomen was filled by a rounded fluctuant tumor, the size of a man's head, reaching up to the umbilicus. At first glance it seemed to be the enormously distended bladder, but only a few drops of bloody urine could be obtained on catheterization, while the tumor maintained its original size. Careful examination then showed that it was surmounted by a hard, rounded body about the size of two closed fists, which was clearly the contracted body of the uterus. On vaginal examination, the posterior and left vaginal fornices bulged markedly, and through them a wave of fluctuation could be transmitted to the abdominal tumor. The cervix showed no signs of a tear, and was displaced upward and backward, so that the external os lay to the right of and just in front of the sacral promontory.

In the absence of external bleeding in a patient presenting the symptoms of acute anæmia, the only possible diagnosis was internal hemorrhage, which was supposed to be due to an incomplete rupture of the uterus, with escape of blood between the folds of the broad ligament.

As the patient's condition had become worse in the interval between my arrival and the completion of the examination, I recommended immediate operation, laying clearly before the family the dangers of such a procedure, but pointing out at the same time that it offered a much greater chance of success than expectant treatment. Accordingly, preparations were made for a laparotomy, the necessary appliances being transported from the hospital. This necessitated considerable delay, so that the operation could not be begun until 1 A. M. At that time the patient was practically pulseless at the wrist, though the heart could be distinctly heard on auscultation. Only a minimum amount of ether was necessary to anæsthetize her.

After the usual preparations, an incision was made in the middle line of the abdomen extending 15 cm. upward from the symphysis. On cutting through the fascia, the ordinary components of the abdominal wall could not be distinguished, and a loose, blood-stained tissue came into view, which was readily broken down by the fingers. Then, instead of reaching the peritoneum, the fingers passed directly into a large cavity, filled with partially clotted blood, situated between the symphysis pubis and the anterior and inferior wall of the bladder, and extending between the folds of the broad ligament to the left wall of the pelvis. It was bounded below by the pelvic floor, so that the fingers emerged beneath the ascending ramus of the ischium anteriorly, while laterally they came in contact with the tuber ischii. Being still under the impression that I had to deal with a ruptured uterus, I extended the abdominal incision upward and exposed the body of the uterus, which was perfectly normal, except for its unusual position. To make the matter absolutely sure, however, I requested an assistant to pass his finger up through the cervix, when it was found that there was absolutely no communica-

tion between the uterine canal and the cavity just described. The peritoneum above the hematoma was then closed, so as to prevent any contamination of the abdominal cavity, and the hematoma rapidly cleared of the clots contained within it. An attempt was then made to locate the source of the hemorrhage, which was found to be from an oozing surface upon the anterior and inferior surface of the bladder, there being no large vessels involved. As it was impossible to apply ligatures, the only means of checking the hemorrhage seemed to lie in packing the cavity with iodoform gauze. This was accordingly done, the vagina being tightly packed at the same time, so as to afford counter pressure.

The abdominal wound was then closed to within 5 cm. of the symphysis, a tight abdominal bandage applied and the patient put to bed in slightly better condition than at the beginning of the operation. During the night she rallied considerably, and by the following morning was practically out of danger. At that time the dressings were so soaked with a bloody discharge that it was necessary to renew them, though the packing was allowed to remain in situ for three days before it was replaced. At that time, a sound introduced into the wound extended downward and backward on the left side of the pelvis for a distance of 10 inches. The wound rapidly closed, so that a smaller pack was used at each dressing, and at the present time all that remains of it is a small sinus three inches long and only large enough to admit a lead pencil.

Intra-pelvic hematoma following labor is extremely rare, hardly more than twenty cases being reported in the literature. The first clear description of such a condition is to be found in Deneux' monograph upon puerperal hematoma (1830), in which it was pointed out that such structures could be divided into two great groups, according as they were situated below or above the pelvic floor, the former being comparatively frequent and the latter extremely rare. Hugenberger in 1865 published a communication upon the subject, in which he reported five cases of his own and collected ten others from the literature. Since that time only isolated cases have been recorded, the great majority of which died, though a few recovered spontaneously. As far as I have been able to learn, this is the first case of the kind upon which an operation has been done, and I feel that the result justified its performance.

It would appear probable that the cause of the hemorrhage was due to tearing through the ante-vesical plexus of veins during the forceps operation, although it was not necessarily responsible for it, as several cases have followed normal and spontaneous delivery.

As far as diagnosis is concerned, it would appear impossible for one to differentiate between the condition in question and an incomplete rupture of the uterus, though this is practically a matter of comparative indifference, as in either event, operative interference is demanded if the hematoma increases in size and the patient's condition is at all serious.

*Meeting of December 21, 1903.*

The meeting was called to order by Dr. Hurd, the President arriving later.

**Observations on the Coagulation of the Blood.** Dr. T. R. Boggs.

Dr. Boggs showed an instrument for timing the coagulation of the blood which was a modification of the apparatus first devised by Brodie and Russell, and gave relatively good results.

Dr. McCrae.—We are all very much indebted to Dr. Boggs for telling us about this method and I am sure we will welcome any simpler method than that now in use. I would like to ask him whether the length of coagulation time as taken by this method is approximately the same as that taken with Wright's tubes.

The observations upon gelatin as described are interesting. Clinically we have practically discarded the use of gelatin to increase the coagulability of the blood, certainly in aneurism cases. We believe in the local application of gelatin to bleeding surfaces.

**The Limitations of Urinary Diagnosis.** Dr. R. C. Cabot, of Boston.

One of the ideals dearest to the student of medicine is the ideal of accuracy. I suppose there is no ideal to which any of us pay homage more regularly. In the attempt to stir ourselves out of the slough of vague guesses in which the practice of medicine has wandered so long, we catch at anything that seems to make for greater exactness in every department of our work, but although we know very well that we want exactness, I do not think we all know by any means what we mean by accuracy in clinical work and I want to say a few words about what I think that word means. It is a truism to say that exactness is relative and never absolute, and yet if we recognize that as a truism we would recognize a corollary of that, that accuracy is always relative to our purpose and what may be accurate enough for one purpose is not enough for another and perhaps too accurate for a third. Perhaps I had better say that misdirected exactness is a danger into which the better trained of the students of medicine in the present are prone to fall. The art of medicine is long and our life is short. We cannot too soon realize that we have got to be inexact somewhere and that the wise man is he who knows where to be accurate and where to get along without exactness. A well-known practitioner of Boston, whose name would be recognized by many of you, was visited by a patient who complained of gastric trouble. The doctor made an exhaustive examination of the abdomen, extracted the contents of the stomach, and analyzed them, measured the size of and marked out the position of the stomach, analyzed the urine, quantitatively, examined the blood, made an estimate of the hæmoglobin, and prescribed for the patient. The patient got no better. The doctor had been very accurate in certain directions, but he had been very inaccurate in taking the patient's history. It turned out that the patient was pregnant. Now the pregnancy could not have been determined by any method

of physical examination, so far as I know, at the time he made his examination, but it might possibly have been determined by taking a careful history. The point that I want to make is that he chose the wrong place for his accuracy. Had he been more careful about the history and less so about the percentage of hæmoglobin, he would perhaps have done better. Misdirected accuracy, then, is possible, as you see from the illustration.

I should like to spend more time on this part of my subject, but must pass to the consideration of a subject upon which I believe that a large amount of misdirected activity is spent—the subject of urinary analysis. My main thesis, in brief form, is that a large part of the time now spent on urinary analysis is entirely wasted. I am speaking especially now of the urinary analyses in renal disease. I shall not speak of those used in diabetes and other diseases in which the kidney is not directly concerned.

Dr. Councilman, in a report on acute and subacute nephritis in 1897, said of urinary analysis that it does not give any sure information as to the type of renal lesion present. At that time I looked upon that statement as a surprising one, but it seems less and less surprising as my own experiences have accumulated. I will begin by giving the accounts of two cases that serve to illustrate my thesis:

CASE I.—An Italian, 27 years old, was brought to the Massachusetts Hospital entirely unconscious having been taken from a vessel which had touched at several South American ports. No history obtainable. Temperature 102.8 with moderate leucocytosis and a slight amount of evidence of consolidation at the apex of the left lung. He had nothing wrong with the abdominal viscera so far as we could demonstrate. There was some retraction of the head and stiffness of the neck. Fourteen ounces of urine drawn by catheter showed a little over ½ per cent of albumen. The color was high but not distinctly bloody, and the specific gravity 1.017. The sediment showed the largest number of casts I have ever seen in any urine—from 10 to 20 in every field of a No. 5 Leitz. The character of the casts were mainly granular with a few epithelial. Prolonged examination of the blood excluded malaria. Yellow fever, cerebro-spinal meningitis and uræmia were considered. Lumbar punctures gave no growth. He died next day. Autopsy showed cerebro-spinal meningitis, and the diplococcus intracellularis of Weichselbaum was isolated. The kidneys showed absolutely nothing so far as Dr. Wright could determine; they were normal macroscopically and microscopically.

CASE II.—More recently a patient entered the surgical wards of the Massachusetts Hospital for abdominal aneurism, as it turned out. It was an abdominal tumor without a clear diagnosis and an exploratory laparotomy was done. Prior to that operation the urine was normal, but immediately afterwards the urine fell to 15 ounces in the 24 hours and never rose above that amount. He died a week later. The urine after the operation was pale, turbid, with a specific gravity of 1.014, and contained .7 per cent albumin. Among the casts, which were very numerous, were many waxy or highly refractile. The diagnosis at the time of death was uræmia. At autopsy absolutely nothing was found in the kidneys, microscopically or macroscopically.

Now, although I had begun the study of this matter long before those cases came to my attention, they served to strengthen my interest. I have been all over the autopsy records of the Massachusetts Hospital since 1893 and I picked out all those in which any definite lesions in the kidneys were found post mortem. Then I went to the histories of those cases and tried to determine how often the lesion discovered could have been determined in life. Then I took the number in which the kidneys were found post mortem to be normal and tried to see whether their histories tallied with the findings. The total result of that study would be too long to go into here and I will only mention its application to three types of nephritis. I have taken account of no cases in which there was not careful examination of the kidneys by microscope and no cases in which the urinary analyses were in any way faulty. Perhaps I should say that I believed those urinary examinations were made with special care, for every man that goes out of Harvard knows a good deal about urinary analysis, even though he may know nothing else. The post-mortem examinations were all made by Dr. Wright.

Out of the 19 cases in which acute glomerular nephritis was found post mortem only five were recognized during life and those were the cases in which œdema existed. Chronic glomerular nephritis gives what at first appears to be a different story; of 17 cases post mortem, 15 were correctly diagnosed during life. But we must remember that the picture of this disease is unusually distinctive without any consideration of the urine. In many of these cases, although the diagnosis was made, I doubt if it could have been made from the urine. The urine showed no more in these cases than in the two cases I have described in which nothing was found post mortem. Of 37 cases of chronic interstitial nephritis, 14 were properly diagnosed as *some* type of nephritis; four were diagnosed as chronic interstitial nephritis, and the remainder were not diagnosed as any kind of nephritis at all.

Now I have given you these facts in the barest way, but I do not see any way of getting around them. The only other thing I want to do is to consider in more detail some of the points in which we have usually placed reliance in urinary diagnosis. In the first place, as to the presence of albumin. I have quoted you two cases in which a large amount of albumin was present without anything in the way of blood or pus in the urine to account for it and no nephritis found. That is a familiar enough fact, but not sufficiently insisted upon in teaching. I shall speak of another point that I trust I need not speak of here, but which needs to be spoken of in our part of the country, that is as to the amount of urine taken for a specimen without regard to the total amount of the 24 hours' secretion. Time and again I have seen teachers point with pride to the narrow zone of the nitric acid test and compare it with the thick zone period as seen earlier in the course of the same case. Now in many of those cases the difference was only due to the greater quantity of water. In regard to the

presence of casts, I will only allude to the fact that in using the centrifuge machine you often get casts in what you had every reason to believe was normal urine. Again I will allude to the statistics published seven or eight years ago by F. C. Shattuck, who analyzed 1000 cases of persons apparently healthy and more than 40 years of age. He showed that more than 70 per cent of those persons had casts, and that without the aid of a centrifuge machine. You all remember Dr. Osler's article on the advantage of casts to persons more than 40 years of age. The two cases I referred to first go to show that the presence or number of casts does not go to prove the degree of kidney lesion.

Finally, I think the misdirected attempts to be accurate is shown in our part of the country most strikingly in the effort to estimate the urea and other solids, without any effort to ascertain the patient's general metabolism. I think 90 per cent of the examinations made for urea in the Massachusetts General Hospital are worthless because no study is made of the metabolism. Perhaps the cause for this is that we still cling to the idea that there is some relationship between urea and uræmia. We still treat the amount of urea as a measure of the activity of the kidney instead of considering it in connection with what the patient takes to eat.

On the whole the methods that seem to me to give the best information are the simplest and easiest methods, the time-honored ones of studying the color of the urine, the 24-hour quantity, and the specific gravity.

### Discussion.

Dr. Welch.—Dr. Cabot, as usual, has presented to us an interesting and suggestive communication. He says that he was surprised by Dr. Councilman's inference from a comparison of anatomical and clinical observations that there was often a striking lack of concordance between symptoms and diagnosis during life and the condition of the kidney found after death. It is perhaps worth noting that the converse is equally true. The pathologist cannot tell accurately from an examination of the kidneys what the function of these organs has been during life; he cannot construct clinical histories from post-mortem appearances.

The explanation of these discrepancies is not far to seek. We do not know upon what precise anatomical lesions urinary changes, especially albuminuria and the presence of casts, depend, notwithstanding much experimental work on the subject. There are, to be sure, many theories. Consider for a moment albuminuria. The primary difficulty is to explain the absence of albumin in the normal urine, for the urine is in part a transudate from the blood, and such transudates are usually albuminous. If we accept the common idea that albuminuria results from some disturbance in the conditions of the walls of the glomerular capillaries and in that of the glomerular epithelium, and consider that such disturbance may be of a subtle nature and that the investigation of these structures is difficult, we can understand that on the one hand there may be marked lesions of the kidney without albuminuria, and on the other hand albuminuria without easily demonstrable structural alterations of the kidney. Similar statements can be made regarding the occurrence of casts in the urine. All of this is well known, and has been discussed by Cohnheim and many others.

We are grateful to Dr. Cabot for presenting this subject. His views have evidently struck a welcoming note in the hearts of our students, to judge from their applause, and I trust that we may hear from their instructors in the subjects touched upon by Dr. Cabot.

Dr. Emerson.—I am now going over our hospital records concerning nephritis, and while I have not yet finished I am quite sure the results will be almost the same as those Dr. Cabot has reported this evening.

We agree with him heartily concerning the value of considerable of the quantitative work on the urine unless the food consumed is known. On one point, however, we beg to differ; the relative value of total albumin and the percentage of albumin. If careful albumin charts be kept it will be seen that the line of the total albumin means little, while the line of albumin per cent depends directly on the diet, the position of the patient, his temperature, etc., and we believe that a urine with a low per cent of albumin means a much better condition of the kidney than one with a high per cent, even though the former, due to the greater total amount of urine, contains a much greater total albumin than the latter, in which case but little urine was passed.

As regards the point which the speaker has emphasized so strongly, the uselessness of accurate work and the sufficiency of simple, quick, approximate methods, our position is the following: We teach accurate methods that the student may be able to use approximate ones. There are three ways of working: inaccurate, which are worse than none, since the results merely mislead; accurate, which we would all do if we had the time (I use the term accurate in the ordinary sense of the term, meaning thereby the best method we know, although we admit that even it leaves much to be desired); and approximate, which we believe can only be safely done by one well trained in the more accurate methods of which the approximate are usually abridgements. To illustrate, the third year class is now in the throes of blood work and the amount of practice involved to gain the standards of accuracy we require is very considerable. We believe that for the practitioner of medicine there is no better method of hæmoglobin estimation than the quick Tallquist scale, but only those can use that safely whose eye has been trained by more careful methods with controls. It is said of a certain famous clinician of Vienna that from the drop of blood on a handkerchief he can guess the hæmoglobin within one-half of one per cent. But how could he gain any such accuracy (undoubtedly exaggerated)? Only by long, patient experience with the Gowers, v. Fleishl, and especially the Miescher instruments. I believe that a trained worker can make a satisfactory blood count by counting one unit square (that is, one-sixteenth of the ruled millimeter surface), but were a student to try to do that the first time his result would be approximate indeed. We therefore insist on a great amount of prac-

tice with control counts until we are sure his technic is such as would justify a diminution in the number of units counted. Although I sympathize with the class just now I see no reason for lightening their burden and shall insist that the prescribed work be done.

DR. CABOT.—The attitude that it seems obvious I ought to take in regard to what Dr. Emerson says about the table of percentage albumin contained recalls to my mind a remark of Dr. Fitz, whom you all know. He had stated to the students one afternoon at his three o'clock lecture that in typhoid fever there was a constant leucocytosis. The matter was called to my attention and the next morning when I met him on his way to the wards I taxed him with it. He said, "I back down." That is my answer to Dr. Emerson.

**Observations on Pericarditis with Effusion.** DR. THAYER.

(See BULLETIN for May, 1904, page 149).

DISCUSSION.

DR. CABOT.—My experience has been very much like that of Dr. Thayer. Most of the taps of the pericardium I have seen have been dry taps. Most of the fruitful ones have been taps well outside the nipple line.

DR. COLE.—The second case reported was of very great interest to me, and the study of it during the short time we had the patient under observation and a study of the condition found at autopsy convinced me that we should be more radical in the treatment of such cases. Unfortunately, the patient was in a desperate condition on admission, and after inserting the needle twice, as Dr. Thayer has stated, I thought best to discontinue the attempt to obtain fluid for a short time at least. A couple of hours later I was making preparations to insert the needle in the axilla when the patient died. At autopsy the heart was found lying closely against the anterior chest-wall, so that in this case the usual situation advised for inserting the needle proved to be the worst possible one. In fact, at autopsy, on inserting a needle through the pericardium at this point practically no fluid could be obtained. However, we could have drawn off a considerable amount of the fluid either in the axilla or by inserting the needle in the back, as the pericardium was distended into a large pouch pushing up the lung and lying against the posterior chest-wall.

Considering the impunity with which the pericardium is freely opened by surgeons in pyo-pericardium or in injuries to the heart muscle, it is a question whether in such cases as this, instead of inserting a small needle, it would not be advisable to either insert a large trocar and through this insert a small soft rubber tube, as a small rubber catheter, or even to make a small incision through the pericardium and through this opening insert such a tube or catheter. This could be inserted as far as desired so as to pass around and below and behind the heart, and by means of an aspirator attached to the external end all the fluid could be withdrawn, even though it lay behind or outside the heart, as in this case.

There would thus be no danger of injury to the heart, and with careful technique there would be no danger of infection. After removal of the tube or trocar a stitch could be taken in the pericardium. I simply offer this as a suggestion, but I can see no objection to a trial being made in a suitable case.

*January 4, 1904.*

The meeting was called to order by the President, Dr. Futcher.

**Effect of Altitude on Blood Corpuscles and Blood Plates.** DR. G. T. KEMP.

The work of which I will give you an account this evening is that of an expedition organized from the graduate students of the University of Illinois, with which I am connected, and I want to say at once that this work was not done by a set of students just entering the University, but by experienced men. Each of the party had had at least one year's experience in special work with the instruments they used on the expedition.

I took the party from Champaign, Illinois, to Cripple Creek, Colorado, for two weeks and went from there to Pike's Peak for a stay of eight days, and then back home. We took the record of blood plates and corpuscles, first at Champaign, then at Cripple Creek and Pike's Peak and at home. Each one of the six of the party was in a thoroughly healthy condition.

Our daily routine work involved the following observations: Count of the red corpuscles, ratio of blood-plates to red corpuscles, determination of hæmoglobin, determination of specific gravity, count of the white corpuscles, examination of the blood under various conditions, with a $\frac{1}{12}$ oil immersion objective.

The blood was drawn from the finger by an ordinary spring lance and each one, standing by to take his observations, was supplied with the same drop of blood so that all the comparisons were accurate. The first thing to which I will draw your attention is this composite curve made up from observations on all six of the party. All followed very closely the same lines: we were thus dealing with a law and not an accident. The red curve represents the number of red corpuscles, while the ratio of blood-plates to red corpuscles is shown by the blue line.

Now as to the red corpuscles, it is an old story that they increase as we ascend to higher altitudes. That was discovered first by Paul Bert in animals kept under diminished atmospheric pressure, and has been corroborated over and over again. On the 11th of July we reached Cripple Creek and on that day our blood count was the same as for the two days prior. Two days later the number of red corpuscles had risen from 5,200,000 to 5,900,000. On the 2d of August it dropped unaccountably in five of us and I could find no cause for it except the possibility of some climatic change. The drop was only temporary. It is a short journey from Cripple Creek to Pike's Peak, but we found in that change from an altitude of 9400 feet to one of 14,200 feet that the corpuscles increased to about 6,000,000. On Pike's Peak we

took records both morning and evening and we were astonished to find that the morning count ran from 600,000 to 900,000 higher than the afternoon count; that is the average of the six; in individual cases is was over 1,000,000.

Now let us consider the hæmoglobin curve. The first thing we found was that it rises and falls in a general way with the curve of the red corpuscles, but that it does not follow this absolutely. As we went to a higher altitude the hæmoglobin percentage increased on the first day before the red corpuscles had increased in number. With this point in mind we could actually predict, several times, an increase in the number of corpuscles from a rise in hæmoglobin percentage, and, in general, if you figure it out you will find that the hæmoglobin varies less than the corpuscles, and that when few red corpuscles are circulating they carry a larger percentage of hæmoglobin. While the number of corpuscles changed markedly between morning and afternoon counts the hæmoglobin varied much less. It is unreasonable to suppose that these red cells die between morning and afternoon, and I am quite prepared to believe that they are simply withdrawn from the circulation for a time; I am even prepared to believe that they are taken into the spleen for some purpose and that possibly they go there to shift their hæmoglobin. It is certainly a fact that when the smaller number of corpuscles are circulating the percentage of hæmoglobin is higher than when the reverse condition obtains.

Now as to the blood-plate ratio. At Champaign the figure was abnormally high. In the winter it ought to be low, from 1:7 to 1:15, but during the summer, the only time our party investigated it, we found it 1:24. Within 24 hours after arrival at Cripple Creek the curve fell enormously and then gradually from the 12th to the 27th of the month.

Please note that the curve represents the values of x in the equation. Plates: Reds:: i: x, therefore a *fall* in the curve represents a corresponding *increase* in the number of blood-plates.

The numerical changes in the blood-plates are far greater than in the red corpuscles, and the change in the ratio between the plates and corpuscles is of longer duration and far more regular. As we returned to Champaign the ratio fell again. So regular is this ratio that if you suppose you are treating a patient at a low altitude, and he is sent higher and falls in the hands of a man who does not possess a blood-counting apparatus, but is able to make a good observation with the microscope, he could count the corpuscles and platelets and obtain a fair index to the changes going on in the blood, from the ratio between the two. It seems that we have here a new index to the development of corpuscles at high altitudes. It might be said here that the leucocytes were not changed by the changes in altitude, either in number or kind.

Now I would like to say a few words about some observations we have made upon the plates in regard to their chemical nature which may throw some light upon the question as to what they are. I am not prepared to say what they are or what they do, but we have strong evidence in favor of the discarded view of Hayem, who claimed that the blood-plates were hæmatoblasts; that is, they made red corpuscles. He is the man who re-discovered the blood-plates and he has done a great deal of work upon the subject, but his claim that they contained hæmoglobin and were really young corpuscles has not been generally accepted. Three years ago I was in Switzerland and started to make some observations on my own blood on the Görner Grat. I had counted my red corpuscles and plates for several days in Paris, and went as directly as possible to the top of the mountain. I was surprised to find that my count in Paris, which was 4,800,000, had risen to over 6,000,000, but the rise in the blood-plates was twice as great; and yet not a sign of hæmoglobin could I find in any one of them. I looked for that very carefully too in this work at Cripple Creek, and we found that along about the 21st, ten days after our arrival, hæmoglobin was seen in the blood-plates. Prior to that the number had increased enormously but no trace of color had been found in them. Just before their number reached its highest point we found the hæmoglobin, and at the same time we found microcytes, but no hæmoglobin could be seen in them either. After the hæmoglobin was found in the platelets we repeatedly found connecting links between the platelets and the red cells. These were, as far as we could judge, identical with Hayem's "globules nains."

From other observations we had made, it appears that the red cells contain comparatively little nuclear matter, whereas the blood-plates are exceedingly rich in nucleo-proteids. This can easily be shown by fixing them on the slide, hardening in alcohol and digesting with artificial gastric juice. We also tried other tests, that of MacCallum and that of Fisher with the nuclear stains. The stains proved that in the specimens of blood-plates the nuclear matter was spread about in them as granular matter while the red cells did not so stain. It thus looks as if the blood-plates were related to the nuclear substances and that they are not derived from the stromata of the red corpuscles.

An account of our methods for numeration of the blood-plates may be found in American Journal of Physiology, Vol. V, 1901, p. iv. Dry preparations will not give accurate or even approximately accurate results.

### Discussion.

Dr. Osler.—As one of the oldest students of the blood-plates it gratified me extremely to hear that one of them had ever been seen by so good an observer as Dr. Kemp in a state of hæmoglobinic redness. I have spent many weary hours over them, but I never caught one "blushing." It really is a point of a very great deal of interest, and that one so familiar with blood-plates as Dr. Kemp, one who has studied them so long, should have made this observation is of extreme value and I am only sorry that the distinguished French observer, Hayem, who wrote so learnedly about them as progenitors of the red cells, is not here to-night to hear the good word. It does not seem possible with our present knowledge to say what the blood-plates are or what they do.

DR. KEMP.—Gentlemen, I have searched with the same assiduity as Dr. Osler, for years, for some trace of hæmoglobin in the platelets and I have not only failed before to find it but I have written against and spoken against the theory; I believe, however, that when a man finds he has been wrong it is well for him to acknowledge it. We did not observe hæmoglobin in the plates until we had remained on the mountain ten days and probably if I had stayed that long in the Alps I should have succeeded there.

Dr. Welch made a point I should like to mention, namely, that no one should ever suppose that a consumptive was improving simply because the plates had increased in their ratio to the corpuscles. We had studied our conditions very carefully before starting on the trip, and the same would have to be the case with a patient under treatment. I believe the ratio will prove to be quite as good an index of improvement as a count of the red corpuscles.

**Vaccine and Vaccination** (Illustrated). DR. GEORGE DOCK, Ann Arbor, Mich.

(See BULLETIN for April, 1904, page 109.)

DISCUSSION.

DR. OSLER.—We have listened with a great deal of pleasure to Dr. Dock's remarks, no portion of which comes home to us more here and in all American schools than that regarding the systematic neglect of vaccination. I do not know that any of our schools demand a certificate of instruction in vaccination before graduation. Such certificates are universally demanded in English and German schools.

The question he has raised of government supervision is most important. It would probably be difficult to get national control, as it is rather a State matter, but the government at Washington might take hold of it through the Bureau of Animal Industry or the Marine Hospital Service and provide free a good vaccine, and thus swamp the private producers. The machinery is there and might well be used.

*January 18, 1904.*

The meeting was called to order by the President, Dr. Futcher.

**Studies in Blood Pressure.** DR. ERLANGER and MR. HOOKER.

After describing the method and apparatus, Dr. Erlanger gave the details of a case of cyclic albuminuria, with reference to arterial pressure. It was found that when the patient was lying down, the pressure was lowest; that it raised if he stood up, and fell again if he sat down. His albuminuria disappeared when the patient was sitting or lying down, but reappeared when he stood up. An increased pulse-rate pressure gave a diminution in the urine output, with an increase in the solids and the nitrogen.

This article will appear in full in Volume XII of the *Johns Hopkins Hospital Reports.*

DISCUSSION.

DR. HURD.—I know nothing about these functional albuminurias, but I am impressed with one point in connection with Dr. Erlanger's remarks. It has been noticed that in melancholia there is often great mental distress in the morning. Very often after an extremely comfortable night, and when the patient may have slept better than usual, the mental distress in the morning is more severe than in the latter part of the day. After the patient has arisen and gone about and has had muscular exercise he begins to brighten up and feels better, and usually in the evening is fairly comfortable. In looking at the figures presented as to the differences between standing and lying down you get an explanation of the distress of these patients in the morning. The output of solid substances has evidently been much greater during the night on account of their recumbent position, and the blood has thereby become more poisoned. Of course there may be some derangement of metabolism back of that in melancholia, but the contrast presented in the figures in the recumbent and sitting postures here given is very striking.

DR. CUSHING.—The society is to be congratulated on the privilege of listening to the report given us of this beautiful piece of work. I feel as if I had taken a mental gallop, and I do not feel as capable of discussing the subject as I should like to do or as I might if we had been given more of the work and seen a demonstration of the apparatus which has been instrumental in bringing about the results.

The result that has been obtained in the study of this case of albuminuria is not, of course, the least interesting part of the demonstration, and it is important from our side of the fence because it shows how useful the study of blood pressure may be made in the interpretation of certain obscure clinical phenomena. If we had an Erlanger to attach to each of our cases in the hospital to study the blood pressure we might progress much more rapidly than we have done.

DR. ERLANGER.—It is now generally believed that the maximum pressure is lower in the standing posture than in the recumbent. This results from the fact that most blood-pressure determinations have been made with instruments that give the maximum pressure only. Quite recently Potain, using such an instrument, has found that the maximum pressure may either rise or fall, the effect depending largely upon the previous condition of the subject. On the other hand Colombo, using the Mosso apparatus, found, as others have since his time, that the change from the recumbent to the standing posture is associated with a rise of pressure. Both of these observations are correct. For, as has been shown, the averages of the pressures indicate that the maximum pressure remains more or less constant but that the minimum pressure rises. This is, however, true of the general averages only. In an individual determination both pressures may either rise or fall, but they invariably approach one another. Therefore, the only constant feature is a diminution of the pulse pressure.

DR. FUTCHER.—I have had an opportunity during the last

week to make a few observations on the urine and blood pressure in a case of albuminuria for Dr. Osler, and there are some points I would like to get information upon, and I hope Dr. Erlanger will be able to give it to me. The case brings out one feature of importance and that is the apparent necessity of taking minimum blood pressures in cases of this kind. The determinations I made were with the Riva-Rocci instrument, which takes the maximum pressures only. The patient was a young girl about 14 with the history of transient attacks of albuminuria. A specimen of urine taken on Wednesday morning showed a specific gravity of 1.014, a trace of albumin and no casts. The urine was free from casts throughout the period of observation. Wednesday afternoon the patient came in for a blood-pressure determination, and after she had been on her feet all day the urine that evening showed about 1-20 per cent of albumin. On Thursday the patient was on her feet most of the day and had some of the nitrogenous foods cut off. That morning the urine contained no albumin whatever, but in the evening there was again approximately the same percentage as before noted. On Friday the patient remained in bed, and morning and evening specimens of urine were examined; the first contained absolutely no albumin and the evening specimen the merest trace. The blood pressure at 5.30 P. M. on Friday was 112, while on Wednesday afternoon it was 150. I had expected that there would be no albumin in the Friday evening specimen, but I found the patient sitting up in bed. I would like to ask whether, in these cases of orthostatic albuminuria, the assumption of the sitting posture in bed will cause the albumin to persist in the urine or whether it is necessary for the patient to be on his feet.

**Mental Symptoms Connected with Distinct Visceral Changes.** DR. CARY GAMBLE.

(To appear in a future number of the BULLETIN.)

**The Periureteral Arterial Plexus and the Importance of its Preservation in the Operations for Cancer of the Uterus.** DR. SAMPSON.

(See BULLETIN for March, 1904, page 72.)

DISCUSSION.

DR. HURD.—I desire to call attention to the great value of the studies which Dr. Sampson is making in this branch of surgery. We have had very few papers presented here which have shown more originality of thought and more care in working out details than the several papers presented by Dr. Sampson this winter. I wish to congratulate him on his successful work.

*February 1, 1904.*

The meeting was called to order by the President, Dr. Futcher.

**Presentation of a Case of Scleroderma.** DR. E. K. CULLEN.

The patient, a young girl 14 years of age, has a sclerodermatous patch over the posterior aspect of the left shoulder. The lesion dates from an injury inflicted twenty-five months before, the patient having struck the affected area against a dresser. The general health has been excellent and the family and personal history are negative.

The area of scleroderma extends from the tip of the acromion process to within a few millimeters of the base of the scapular spine, upwards to the anterior border of the trapezius and downwards to one finger's breadth below the spine of the scapula. The patch is slightly irregular in outline. The center presents an atrophic and ivory white appearance. At points, particularly about the outer edge, are fine, glistening scales, while scattered throughout are little irregular areas showing a light brownish pigmentation. The skin, which over the entire area feels hard and thickened, is pinched up with difficulty, but at only one point near the base of the scapular spine is there any pain experienced during this procedure. The border is thin, undulating, slightly elevated, and appears to be formed by a minute plexus of vessels. In its outer and upper parts the border is more prominently defined than in its lower and inner parts where it shades off gradually into the normal skin.

*Treatment.*—On August 8, the date of admission to the dispensary, treatment by thyroid extract was commenced. The compressed thyroid tablets were used in the following dosage:

Grs. iiss once a day for two days.
Grs. iiss twice a day for two days.
Grs. iiss three times a day for two days.

The thyroid treatment has been continued for the past five and a half months, with only a small intermission of a week, on two occasions. No ill effects have been observed and the patient has continued to increase in weight. The skin has become much softer and is gradually assuming the normal consistence and color.

DISCUSSION.

DR. OSLER.—The case is an unusually interesting one, particularly from the standpoint of the patient's condition at present. It is very unusual to see so rapid improvement. Of course the local scleroderma is a more hopeful condition than the generalized form. A great many cases recover completely and only a few instances progress to the diffuse form. There is no essential difference between the conditions, although most text-books consider them separately. I have had under observation 18 cases of scleroderma (8 of which I have reported), only two of which were of the local type. Of these, one has been very much helped by the thyroid extract; she has been under my observation three or four years, and while not cured, the skin has become soft, all the induration is gone and there only remains the extensive pigmentation.

Of course in the general features the diffuse and the localized scleroderma are quite distinct. I do not know that there is any disease that brings to the patient so much distress and suffering as does the diffuse type. One of our recent cases was literally encased in a shirt of Nessus. He was unable to

move his arms or legs, his entire body was as stiff as a frozen pig.

There is a group of cases intermediate between the localized and diffuse form. A young man in a neighboring town has a condition of the left arm like Gowers described as local panatrophy, in which the process has involved skin, muscles and bones.

In two of our cases of the diffuse type it may be said that the disease has been arrested. One of them has been under observation for ten years, and while his hands are distorted he is able to go about in fairly good health. In another of the cases which I reported, the patient had a most extensive scleroderma of the hands and legs. I hear through Dr. Thayer that the patient is wonderfully better in spite of an ardent devotion to Bacchus. He says he could not live without thyroid extract.

**A Case of Myelogenous Leukaemia. (With exhibition of the patient.)** DRS. C. E. SIMON and D. G. J. CAMPBELL.

The patient is a woman, æt. 35, with nothing of moment in her family or personal history until about two years ago (1901). She then noticed a bulging from below the ribs on the left side, which gradually increased and extended to the left groin. On first examination, at the City Hospital (March, 1903), the growth was recognized as the enormously enlarged spleen. Blood examination at that time showed a typical picture of a myelogenous leukæmia. Within a month the leucocytes fell from 350,000 to 4000 and have since not risen beyond normal values. The relative percentages, barring a persistent increase of the mast cells, became practically normal, and ever since May, 1903, the spleen has been barely palpable on deep inspiration. Fowler's solution was used in large doses.

(At the time of writing, April, 1904, the patient's condition remains unchanged. The case is thus the only one on record in which both the splenomegaly and myelæmia have disappeared and improvement has persisted uninterruptedly for a year.)

The full report of the case with a review of the literature will appear in the *Medical News*.

DISCUSSION.

DR. OSLER.—We have had three cases here in which the leucocytes have disappeared entirely in leukæmia. In the case Dr. Campbell referred to, reported by Dr. McCrae, the leucocytes disappeared entirely and he left the hospital apparently well, though, if I remember rightly, he had some blood changes left that were suspicious. As Dr. Campbell remarked, his subsequent history was not clear. He died in California.

In the other two cases the spleen did not disappear, but remained large while the leucocytes fell to normal. One of those cases is reported in the American Text-book of Medicine, in the article on leukæmia, and the other case some of you have seen during the year in the hospital wards. Those are the only three instances in my recollection in which I have seen the leucocytes fall to normal and remain so.

The second point of interest in this case is the length of time during which he has taken arsenic and in such large doses. I would be inclined to attribute the good effects secured in this case to the arsenic and think there is no question but that in the full and complete treatment with it we do see such marked improvements. It is just these cases that stand the long-continued treatment with arsenic and have a chance to improve.

**Remarks on Pneumonia in Diabetes Mellitus.** DR. FUTCHER.

DISCUSSION.

DR. OSLER.—I think one of the interesting points about this case is the acuteness of its course, by far the most acute case we have had in the hospital in an adult. It does occasionally happen in the adult that the disease runs a very acute course, and I saw one case in which from start to finish it was only three weeks. It is often a matter of surprise in making a routine examination in diabetes to find extensive pulmonary lesions, and it is often noticed that without cough or fever a patient may have progressive wasting, and that may alone be the feature indicative of progressive disease in the lung.

DR. FRANK R. SMITH.—About three years ago I was called to see a man in a comatose condition and his doctor told me that for two years there had been a large amount of sugar in his urine. He said the case was undoubtedly one of diabetic coma, and opinion with which I at first fully agreed. We examined him carefully, however, and found he was suffering from pneumonia. He got over the pneumonia, the sugar disappeared from the urine, and nine months later it was still absent. I do not know his ultimate condition.

We sometimes accidentally discover diabetes that has been going on for a long time. About a month ago a man came into my office complaining only of a slight sore throat, but while there asked if he might pass his urine. He passed about a pint and a half of clear urine with a specific gravity of 1.035 containing a large amount of sugar. I had inquired about thirst and hunger before making the examination, and he said he was never thirsty, although he might have had a habit of drinking a good deal of water. A case of this kind might have been going on for many months, and I mention it to show how difficult it often is to establish the exact date of the onset of the disease.

**Loco weed Disease of Sheep.** DR. MARSHALL.

Dr. Marshall took part in an expedition sent out by the United States Department of Agriculture during the autumn of 1903 to investigate the loco weed disease in Montana.

Loco disease is a disease affecting horses and sheep and occasionally cattle and goats. The victims are supposed to be poisoned by the loco weed, for which they form a preference, eating the weed to the exclusion of other diet. *Astragalus mollissimus* and *Aragallus spicatus* are the two commonest loco weeds. Accessory factors are considered of great importance by the ranchers. (1) Age. Almost without ex-

ception the disease appears before the end of the second year. (2) Insufficient food is frequently the important predisposing factor. (3) Insufficient supply of water is equally important. Lack of salt is considered by many ranchers to be the most important of all predisposing factors. Many think that if animals are well supplied with salt they will escape loco disease altogether. (5) All ranchers agree that *healthy animals never acquire loco weed disease. A lowered state of vitality is always a precursor of loco weed disease.*

This malady has been known for 50 years or more. It was first recognized in Mexico or Texas. It gradually spread north and reached Montana about ten or twelve years ago. It is found from western Kansas to California on the prairies and foot-hills at an elevation of about 4000 to 6000 or 7000 feet.

The incidence varies from year to year. In affected regions from 10 to 25 per cent of the annual increase die from this cause. The disease spreads in epidemic manner, appearing first as a rule not sooner than 10 or 15 years after a region has been settled. The disease appears in early spring and late autumn. The symptoms come on insidiously. Tame, well-broken animals become unmanageable. Defective vision, mental and nervous symptoms develop. Ultimately the victim emaciates, eats nothing except loco weed, in the search for which he spends his time, and after a long period, usually months or years, dies from weakness or intercurrent disease.

The only "locoed" animals that could be found on the recent expedition were sheep. About 1000 "locoed" sheep were seen on different ranches, from which number reliable and experienced rangers selected a few of the sickest and most typical "locoed" animals for study. Experiments indicated that these "locoed" sheep did not prefer a diet of loco weed to one of grass or alfalfa. Feeding experiments caused no new symptoms. The symptoms were not alike in all cases. All of the cases were in lambs or yearlings; all were undersized, emaciated and weak, with stilted gait, drooping head and dull eyes. Sensation, sight, hearing, etc., appeared normal. Many of the "locoes" showed defects in the incisor teeth. In one or two flocks large numbers of animals were afflicted with bronchitis, conjunctivitis, etc. Usually the fleece was rough. One animal had a muscular tremor. Autopsies were held upon the freshly killed animals. Tissues were fixed in Zenker's fluid and examined microscopically. No anatomical evidence was found of injury produced by the loco weed. In every case the sheep were infected with from one to five parasites. The parasites found were: (1) *Thysanosoma actinioides* or "fringed tapeworm," obstructing the bile ducts in 9 cases; (2) *Haemonchus sp.* in the 4th stomach in four cases. This worm which appears to be a new species similar to the *Strongylus contortus,* is being worked up by the United States Bureau of Animal Industry; (3) *Metastrongylus filaria* in the bronchioles in 5 cases; (4) *Sarcocystis tenella* in the muscles in 7 cases; (5) *Cysticercus tenuicollis* adherent in peritoneal cavity in 5 cases; in one of these cases a cyst was also found free in the pericardium. Dr. Chas. W. Stiles kindly identified the worms for Dr. Marshall.

In addition, an extradural basilar abscess was found in the animal which exhibited muscle tremor. These results were obtained from 11 complete autopsies. Many other partial autopsies gave the same results. The "fringed tapeworm" produced a dilatation of the bile ducts and often of the pancreatic ducts and there was strong evidence that it also produced occasionally an obstructive biliary hepatitis.

From its resemblance to *S. contortus* it seems probable that the Haemonchus is a dangerous enemy to the sheep. Its exact action could not be determined, but it evidently is less virulent than the *S. contortus.*

The *Metastrongylus filaria* was found in all of the cases with bronchitis, conjunctivitis, etc. The *Sarcocystis tenella* was found in every case in which the tissues were studied microscopically. Apparently it is harmless, as is the *Cysticercus tenuicollis.*

After a discussion of his findings and of the data obtained from the literature and from the ranchmen, Dr. Marshall concluded that the evidence indicates that there is no true loco disease of sheep produced from eating the weed, but that so-called "locoed" animals suffer from bad feeding, insufficient care, and a variety of other diseases, the most important of which are the parasitic diseases.

## NOTES ON NEW BOOKS.

The Lymphatics. General Anatomy of the Lymphatics. By G. Delamere. Special Study of the Lymphatics in Different Parts of the Body. By P. Poirier and B. Cunéo. Authorized English translation. Translated and edited by Cecil H. Leaf, M. A., M. B., F. R. S. (Eng.), Assistant Surgeon to the Cancer Hospital, etc. With 117 illustrations and diagrams. (*Chicago: W. T. Keener & Co., 90 Wabash Ave., 1904.*)

The book represents the results of the labors of Prof. Poirier and his pupils brought up evidently to 1902. The first part deals with the general conceptions of the anatomy of the lymphatic system and with the physical and chemical nature of the lymph. Following this is a rather minute consideration of the morphological elements of the blood and lymph in which Ehrlich's views receive due discussion and the classification of cells adopted is essentially his. Morphology, physical and chemical properties, biological characters and modes of development and reproduction of these cells are entered into in detail. All of this is characterized by great breadth of view and fairness of judgment. We may, however, criticize certain statements as premature, for example on p. 35, it is said that, "It is proved that a leucocyte can become a connective tissue cell and it is at least very probable that a connective tissue cell can become a white cell." Again the objections to the use of the term myelocyte on pp. 36-37 seem insufficiently supported. The descriptions of the various types of cells are excellent.

Then follows a historical sketch of the development of our knowledge of the anatomy of the lymphatic vessels up to the work of v. Recklinghausen and Ranvier. Throughout this chapter the view is held that there are completely closed vessels lined with endothelium and that there is as good evidence for the view of v. Recklinghausen as to their free communication with the tissue. Ranvier's conception of the lymphatic system as a gland emptying into the veins is given, but at the time the book appeared

the authors had evidently not seen Dr. Sabin's classical description of the development of this system.

Some interest attaches to the discussion of the distribution of lymphatics especially in the statement that it is still very uncertain whether or not any lymphatics exist in the brain and meninges.

A minute account of the anatomy, development and physiology of the lymph glands follows, characterized by the same breadth of view and abundance of detail. The second part of the book, and by far the larger part, is devoted to the study of the regional anatomy of the lymphatic system.

The literature references which are arranged in chronological order are very complete and since the translation is very good the book forms an excellent book for reference, even if one can refrain from reading it through.

A Text-book of Legal Medicine and Toxicology. Edited by FREDERICK PETERSON, M. D., President of the New York State Commission in Lunacy; Clinical Professor of Psychiatry, Columbia University, New York; General Consultant to the Craig Colony for Epileptics, Sonyea, New York, and WALTER S. HAINES, M. D., Professor of Chemistry, Pharmacy and Toxicology in the Rush Medical College, Chicago; Professorial Lecturer on Toxicology in the University of Chicago. Volume II. *(Philadelphia, New York and London: W. B. Saunders & Co., 1904.* 825 pp.)

The completion of this excellent work will be welcomed by teachers of this subject as well as by physicians and lawyers who find it necessary to consult a fairly comprehensive work on forensic medicine.

Part 1 of volume II is devoted to the subjects relating to sex, insanity and malpractice and contains a brief but well written chapter on the medico legal relations of the Röntgen rays including the interpretation of skiagraphs and a discussion of the X-ray burns. Part 2 is devoted to toxicology and this portion is exceptionally good. Many references to the original sources of the material are given. The various subjects are written by eminent specialists. Thus it might be mentioned that the chapter on the alkaloid poisons is written by Prescott. Vaughn contributes a chapter on the ptomains and other bacterial products in their relation to toxicology.

Taken altogether the work is a most satisfactory one and deserves to be largely used. A. S. L.

Blood Immunity and Blood Relationship. A demonstration of certain blood relationships amongst animals by means of the precipitin test for blood. By GEORGE H. F. NUTTALL, M. A., M. D., Ph. D., University Lecturer in Bacteriology and Preventive Medicine, Cambridge; including Original Researches by G. S. GRAHAM-SMITH, M. A., M. B., D. P. H., Cambridge; T. S. P. STRANGEWAYS, M. A., M. R. C. S. *(Cambridge: At the University Press, 1904.)*

This volume of 400 pages summarizes the results of the original researches of Dr. Nuttall upon the subject of the *precipitin reaction*, portions of which have already been published either alone or in connection with his two co-workers, Graham-Smith and Strangeways, in various numbers of the Journal of Hygiene, British Medical Journal and other periodicals. It aims to put in concise form, ready for accurate reference, not only the observations made in Cambridge, but also those of other workers who have busied themselves along similar lines. This publication is particularly interesting, because primarily Nuttall was, early in the days of the Pathological Laboratory of the Johns Hopkins University, a most valued assistant in bacteriology and hygiene and while here established a reputation for enthusiastic painstaking and accurate investigations, his work being noted both for the originality of his ideas and for the original methods by which they were put in execution. Secondarily it may be mentioned that Dr. Nuttall's early studies of the bactericidal properties of normal blood serum, conducted while working for his doctor's degree in Flügge's laboratory in Breslau, were the starting point for that enormous development of the study of the blood sera of normal and immunized animals, and in a certain sense, of the development of the humeral theory of immunity, even though Nuttall's work was antedated by some isolated observations of others, and in spite of the fact that Nuttall has not received merited recognition for this work in Germany itself.

The main thesis of Nuttall's present publication is the claim that by means of the *precipitin reaction* seen on mixing the blood serum of an animal treated with the blood serum of an alien species, with portions of the original serum employed, the *phylogenetic relationship* of various members of the animal kingdom may be determined with almost absolute accuracy, with far greater accuracy indeed than the study of morphological or functional characters has thus far been able to carry us. For the proper understanding of the main portion of the book, including extensive tables giving records of over 16,000 different tests, the first third of the book at least is given up to an accurate analysis of the literature of the subject of *precipitins* and of those closely allied subjects of *agglutination* and *haemolysis*, including here a brief consideration of Ehrlich's theories.

Quite aside from the main purpose of the book the preliminary portion is invaluable, not only because it is the first extensive literary study of precipitins, but because it is invested with the accuracy and completeness of Nuttall's usual methods. The experiments of nearly every observer in this field are cited, their methods criticised, their results analyzed, and a careful opinion passed upon the value of their work. Extensive consideration is given to the various factors which may influence the *precipitin reaction*, while the effects of chemicals, heat, cold, and putrefaction are all made the subject of personal investigation by the author and his associates.

The methods of obtaining blood sera, the manner of immunization of animals, and the technique of the reaction itself are all described with painstaking exactness.

The principal part of the book of course is taken up with the consideration of Nuttall's own experiments. During the progress of his investigations he has prepared anti-sera for a very large number of animal species, including man, chimpanzee, ourang, monkey, hedgehog, cat, hyena, dog, seal, pig, llama, hog-deer, Mexican deer, antelope, sheep, ox, horse, wallaby, among the mammalia; fowl and ostrich, among the aves; turtle and alligator, among reptilia; frog among the amphibia, and lobster among the crustacea. With the sera thus obtained Nuttall has tested the blood of nearly every known species of domesticated or wild animals, specimens being sent him from nearly every quarter of the globe. These specimens were obtained in the field by collectors, dried on strips of filter paper, sealed up in cases, and sent to Cambridge, where they were carefully catalogued and preserved.

Each anti-serum was now tested with the serum employed in immunizing the animals, an homologous serum, and with sera from various other species, heterologous sera. The strength of the reaction obtained with the homologous serum, as measured by the amount of the *precipitum* was now carefully compared with that seen with the heterologus sera. Thus anti-human serum was tested with human serum, with various fluids from the human body, ascitic and pleuritic effusions and urine, with serum from other primates including chimpanzee, gorilla, mandrill, guinea baboon, monkey, lemur, and from a number of less closely related species. In the same way anti-monkey serum was tested with a similar series of bloods, while the sera obtained from the employment of other orders, were tested against the blood of members of that order. Thus anti-horse serum was tested with

blood from the equidæ especially, and from as many other closely related families as possible. It is apparent at once what an enormous number of observations would result from faithful adherence to this system, over a relatively long period of time.

As a result of several thousand reactions Nuttall concludes that the blood serum of an immunized animal *always* gives an abundant precipitum with that from the species employed for immunization, but gives as well a similar but quite positive reaction with the blood sera of species closely related zoologically. The latter reaction Nuttall would term the *mammalian reaction*.

The conclusions derived from these reactions and the relationships suggested by their application to such a large number of species afford the morphologist a most interesting theme for speculation. A few examples of the relationships indicated must suffice.

Anti-human serum reacts most markedly with the serum of man, but gives definite reactions with the blood serum of the simiidæ and the cercopithecidæ, although little or no reactions develop with the serum of the lemuridæ. Anti-chimpanzee serum reacts markedly with the blood of the homidæ and the simiidæ not at all with that of the lemuridæ, partially with that of the cercopithecidæ.

Anti-ourang serum reacts most markedly with the blood of the simiidæ and the cercopithecidæ, partially with that of the homidæ. Anti-monkey serum reacts best with the serum from the cercopithecidæ, less with that of the homidæ, not at all with that of the lemuridæ. From these and other observations Nuttall concludes that "if we accept the degree of blood reaction as an index of blood relationship within the anthropoidea then we find that the Old World apes are more closely allied to man than are the New World apes, and this is exactly in accordance with the opinion expressed by Darwin."

Again the anti-sera for hyenidæ give positive reactions for the homologous blood of hyenas and for the closely allied blood of cats, while the anti-sera for cats gives positive reactions not only for cat's serum but for that of the hyenidæ. Other sera were negative and one is thus led by the precipitin test alone to conclude that hyenas and cats are closely related genetically.

Similarly anti-reindeer serum reacts with reindeer serum, with serum from other cervidæ and with the closely related bovidæ, not with the serum from other mammals. Anti-sheep serum reacts most markedly with sheep's blood and the blood of the cervidæ, partially with the blood of the suidæ, not at all with other mammalian bloods.

Anti-pig serum, however, while giving most marked reactions with the blood of the suidæ also reacts abundantly with the blood of the cetacea, an unexpected result confirming the hitherto expressed opinion of Flower and Lydekker that the cetacea are more closely related to the ungulata than to the carnivora, and that "the old popular idea which affixed the name of sea hog to the porpoise contains a larger element of truth than the speculations of many accomplished zoologists of modern times."

It may be noted in passing that Nuttall's results with anti-human serum and with anti-monkey serum absolutely confirm the experiments of Wassermann and Uhlenhuth, whose observations, however, were conducted upon a considerably smaller number of species.

Finally not only are the reactions carefully estimated qualitatively but by means of a specially designed apparatus for measuring the quantity of the precipita obtained from the mixtures of various sera, Nuttall and Strangeways have made a large number of *quantitative* determinations of the reactions studied previously *qualitatively*, the former series of observations confirming in every particular the latter.

The last section of the book is in many respects the most interesting. Here Nuttall considers the precipitin test in its application to legal medicine in the identification of blood stains, especially in the identification of human blood by means of anti-human serum. He first considers in detail Wassermann's and Uhlenhuth's experiments bearing upon this point as well as his own previous communications upon the subject, and analyzes the many factors which may have any bearing upon the carrying out of the blood reaction in its application to forensic medicine, such as the action of chemical substances, rust, dyestuffs and other materials upon blood tending to vitiate its properties to such an extent that it may fail to react with its peculiar serum, as well as the presence in suspected material of substances which may give reactions simulating the precipitin reaction. In this connection he quotes a number of experiments of Graham-Smith and Senger, upon blood stained weapons and fabrics obtained from Scotland Yard, in all of which, despite the great age of some of them, as much as 25-30 years, a positive reaction was obtained with anti-human serum, and no reaction with anti-ox serum. Special observations were made to determine the effect of drying blood upon metal, organic materials, leather, of mixing it with lime, mortar and earth, only one of the latter substances, lime, being shown to actually destroy the blood when brought in contact with it. With no other material was human blood so affected that it did not give a positive reaction with anti-human serum.

The general conclusions of the book are summarized into two final pages.

The entire volume is filled with most interesting information not only in regard to the work and ideas of others, but in regard to the results actually obtained in Cambridge. Many of the tables presented seem at first sight difficult to understand, but after a certain amount of study and close observation of the various symbols utilized in preparing the tables, they become quite explicable. When one considers moreover the vast number of reactions given one realizes that some definite system of recording the strength of the reactions had to be employed.

There is but one adverse criticism which can be made and that is applicable to all who work upon the complex problem of immunity. There is too great a tendency to explain the occasional occurrence of anomalous reactions, especially if somewhat unexpected, by errors in the collection of the samples of sera. While it is perfectly possible that errors may have arisen, such as the occasional interchange of samples and labels, or the rubbing of one blood against another in the process of drying, in view of such an enormous number of positive results testifying to the care with which the specimens were collected, it is hardly fair to claim that when a few sera fail to give the desired reaction, some mistake must have been made in collecting them. While unexplainable and unforseen reactions do mitigate to a certain extent the absolute or relative specificity of the precipitin reaction, no one who has done any piece of investigation with immune sera will fail to admit that occasionally reactions develop which are absolutely out of keeping with any knowledge we now possess in regard to these very complex and intricate phenomena. In spite of this tendency, this book of Dr. Nuttall's upon "Blood Immunity and Blood Relationship" is not only the best publication upon the entire subject of precipitins, now extant, but contains such a mass of new material, new facts, and new conclusions, that it substantiates the author's own claim that "in presenting the results given in this book he is safe in saying that they constitute the first scientific demonstration on general lines of the specificity or relative specificity of precipitins."

The book is dedicated to Ehrlich and Metschnikow. W. W. Ford.

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